

ACE-Asia Technical Appendix

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Introduction

Assembled below are details of the various measurements made during ACE-Asia. They are organized by platform, starting with the aircraft, then ships and surface sites. In each case there is a table of measurements and participants, some indication of interesting times or events observed by that platform, flight or cruise tracks, and information about where to find the data. In some cases (particularly for the smaller surface sites) we were unable to obtain a definitive measurement list. Further information can be found at the ACE-Asia website:
<http://saga.pmel.noaa.gov/aceasia/>

I. NSF/NCAR C-130 Aircraft

I.A. Table of C-130 instruments and participants

Flight schedule:

Pacific transit west: departed Colorado: 23 March 2001; arrived Japan: 29 March 2001

Asian flight operations: 30 March to 4 May, 2001

Operations Airfield: Iwakuni MCAS, near Hiroshima, Japan, 34.08.6N, 132.14.2 E

Pacific transit east: departed Japan: 7 May, 2001; arrived Colorado 11 May, 2001

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Aircraft operations were designed to sample regional aerosol features (e.g. dust outbreaks, urban and industrial plumes) under different synoptic meteorological patterns and at various distances from shore.

The following PIs were funded to work on the C-130, making these measurements. Many of the aerosol methods took their samples from the LTI, the new low turbulence inlet.

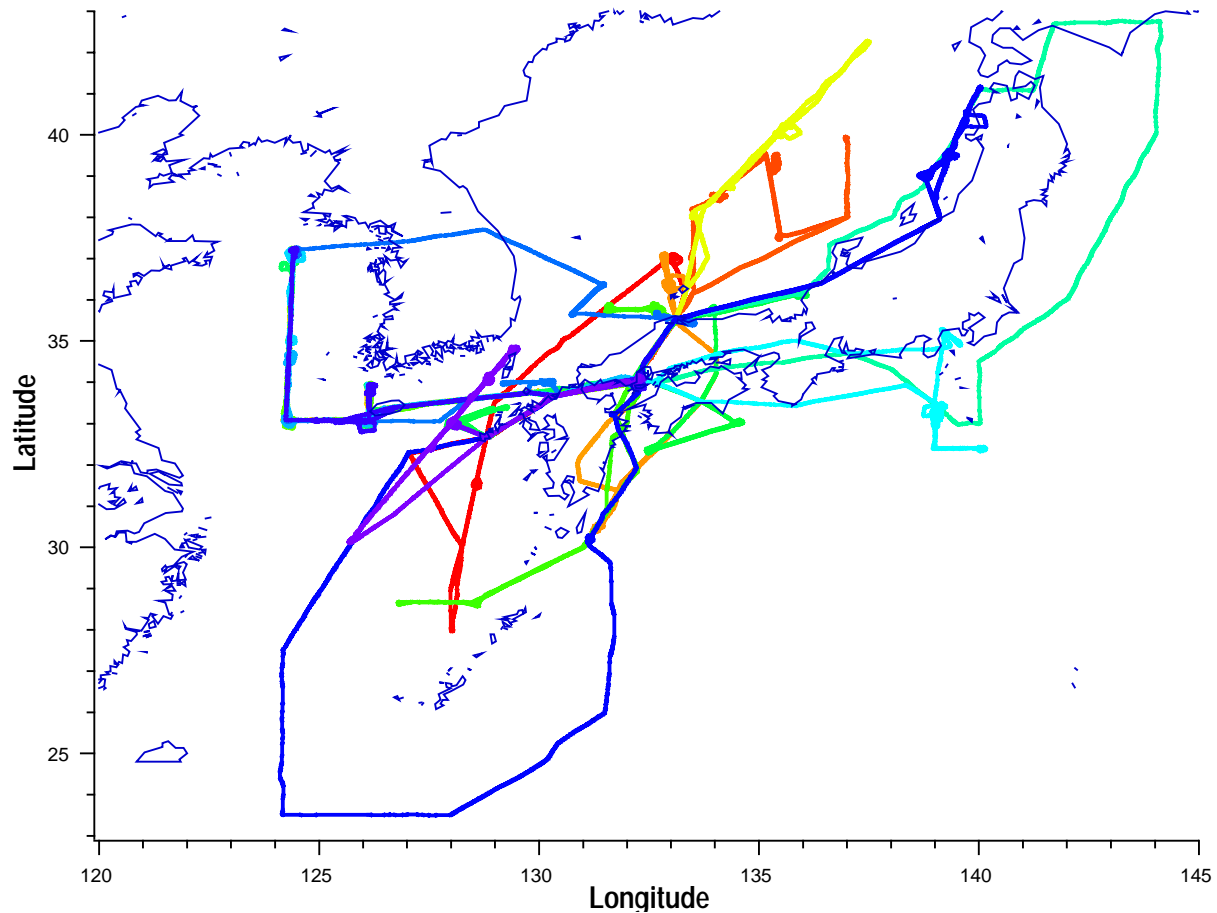
Organizations Participating	PI
University of Hawaii	Barry Huebert, Byron Blomquist, Steve Howell, Tony Clarke
Drexel University	Alan Bandy, Don Thornton, Byron Blomquist
Princeton University	Lynn Russell
Arizona State University	Jim Anderson
Institute of Low Temperature Science, Hokkaido University (ILTSa)	Kimitaka Kawamura
University of Washington	Dave Covert, Tad Anderson
NASA Ames	Phil Russell
Scripps Institute of Oceanography	Francisco Valero
Academia Sinica, Chinese Taipei	Tai-Yih Chen
NCAR	Teresa Campos, Hans Friedli
DMT, Inc.	Darrel Baumgardner
Georgia Tech	Rodney Weber

Measurement	Method	PI
Aerosol Chemical Measurements		
Mass size distributions of nss sulfate, MSA, ammonium, and other major ions	Five stage micro-orifice cascade impactor, IC analysis, from LTI	Huebert
Total nss sulfate, MSA, ammonium, and other major ions	Total Aerosol Sampler, IC analysis	Huebert
Fast anions and cations, 3-4 minutes	PILS-IC	Weber
Mass of organic and elemental carbon < 2-3 um	PC-Boss with quartz, CIG filters, Sunset Labs analysis	Huebert
OC, functional group identification via FTIR	Solvent-rinsed submicron impactors; bulk samples 0.1- 1.0 um @ 40% RH, from LTI	L. Russell
Lipid class compounds (dicarboxylic acids, hydrocarbons, fatty acids, alcohols, etc.)	GC and GC/MS, from LTI and TAS	Kawamura
Sized mineral aerosol	EM, SEM, TEM, from LTI and TAS	J. Anderson
Aerosol Physical and Optical Measurements		
Total aerosol number, heated and ambient, including nanoparticles	TSI 3010, 3025	Howell/Clarke
Number size distribution from 5 to 10,000 nm diameter	Tandem DMPS and APS system Size distribution	Howell Clarke Huebert
Number size distribution, 8 – 120 nm	NCAR RCAD	L. Russell
Continuous integrated and 180° light scattering and backscattering by aerosols at 3 wavelengths, total and submicron	3 wavelength TSI nephelometers - one with a 1 and one with a 10 um impactor	Covert, T. Anderson
Light scattering vs RH, f(RH)	Two Radiance Research nephs, 545 nm only, one humidified and one ambient	Howell/Clarke
Total and submicron aerosol light absorption at 565 nm	PSAP	Covert, T. Anderson
Aerosol Microphysics	FSSP 100, 300, PCASP	Baumgardner
Aerosol backscatter	SABLE Lidar, up/down	Morley
Radiation Measurements		
Aerosol optical thickness (380-1020 nm), water vapor column	AATS-6 tracking sunphotometer	P. Russell
Direct irradiance, diffuse irradiance, total irradiance	TDDR Shadowband radiometer, up looking	Valero
Total solar and near infrared fluxes, up and down welling	Multi channel 400-700nm flux radiometer (MSR), Total Solar Broadband Radiometer (TSBR), and near-IR Fractional Solar Broadband Radiometer (FSBR) - all looking up and down.	Valero
Direct irradiance, diffuse irradiance, total irradiance	Shadowband radiometer	Valero
UV flux	radiometers	NCAR/RAF
Atmospheric Trace Gas Measurements		
SO ₂ > 1 Hz	APIMS	Bandy
O ₃	Dasibi	Campos
Fast O ₃	NO Chemiluminescence	Campos
CO	UV resonance fluorescence	Campos

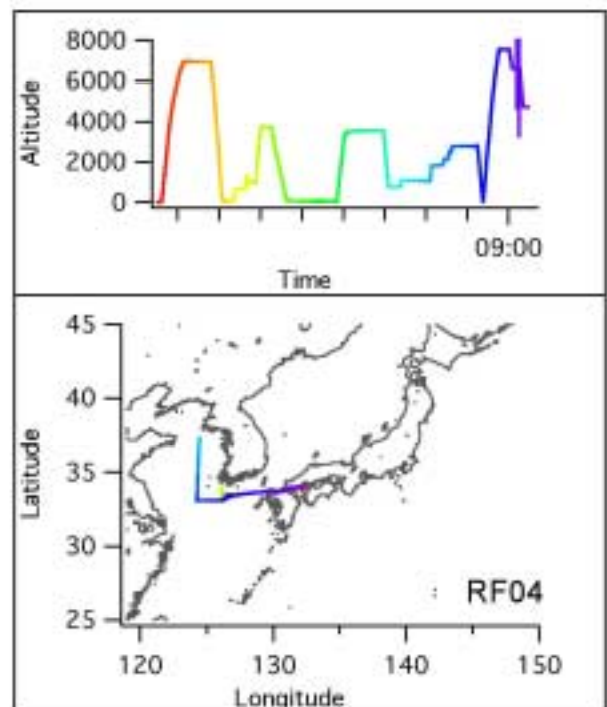
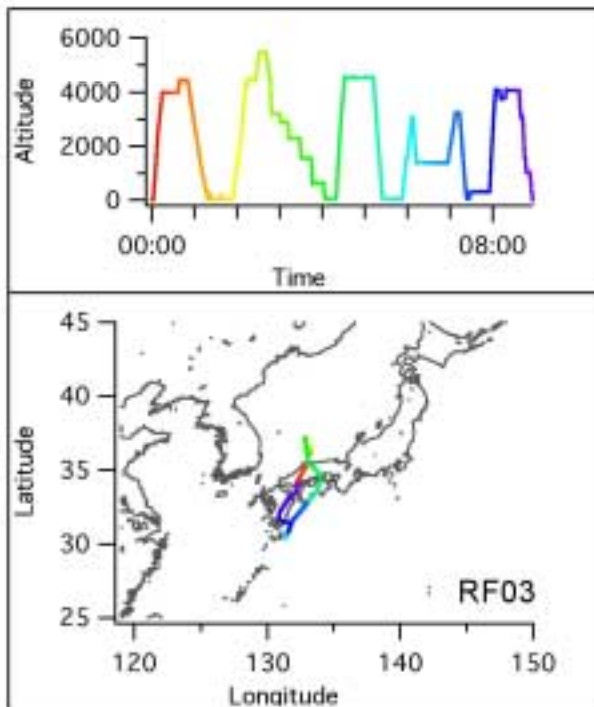
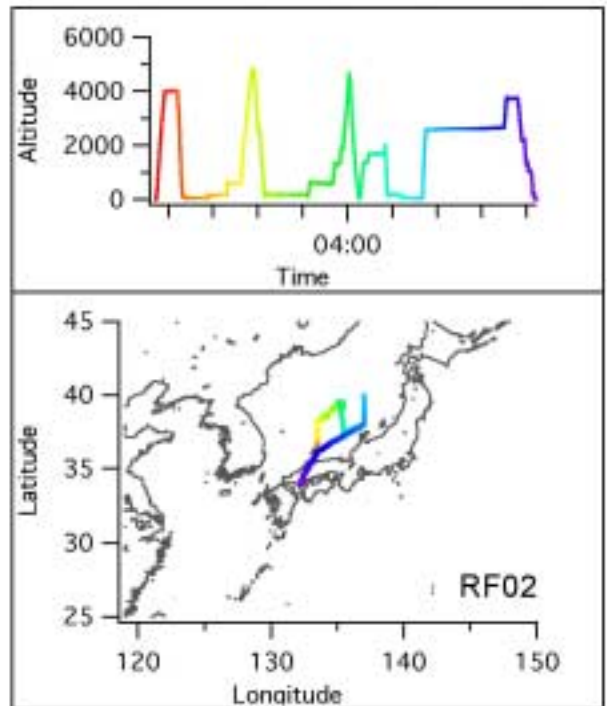
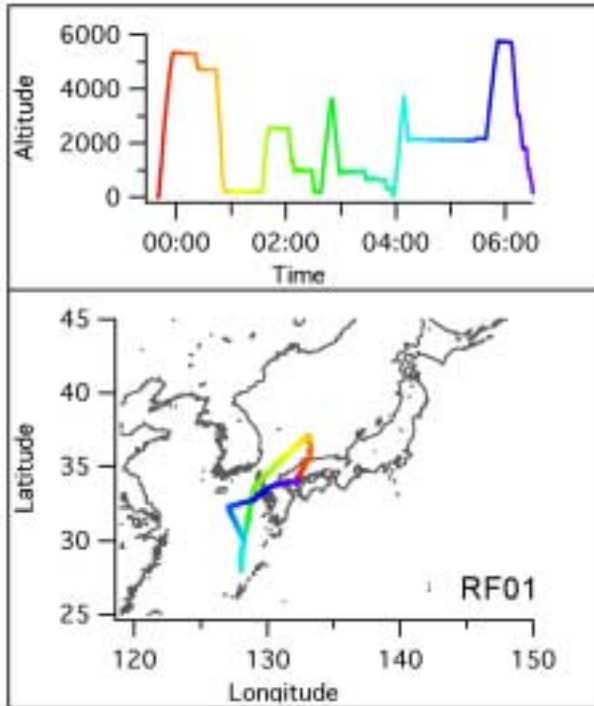
CO ₂	IR	Campos
HCFCs, CFCs	GC, can sampling	Chen
13C in NMHCs	Can sampling	Kawamura
Hg vapor	Spectroscopy	Friedli
Meteorological Measurements		
Location, winds, thermodynamic variables, H ₂ O	various	NCAR RAF

I.B. Figures of C-130 flight tracks

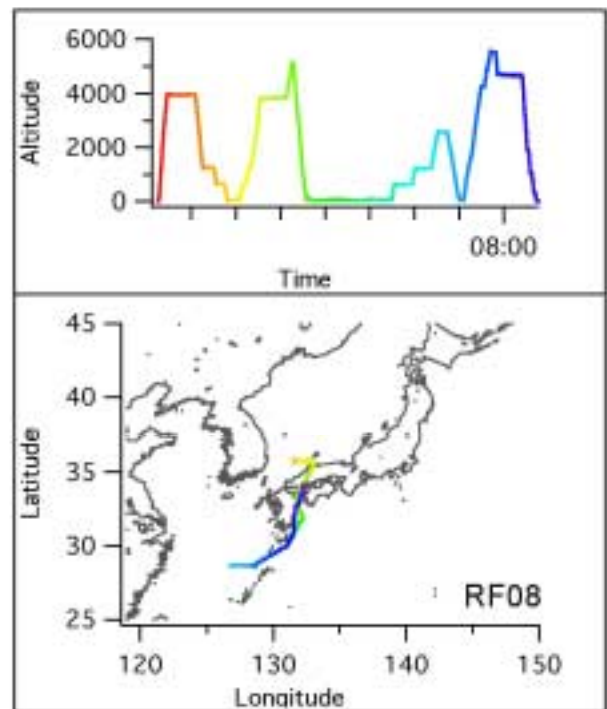
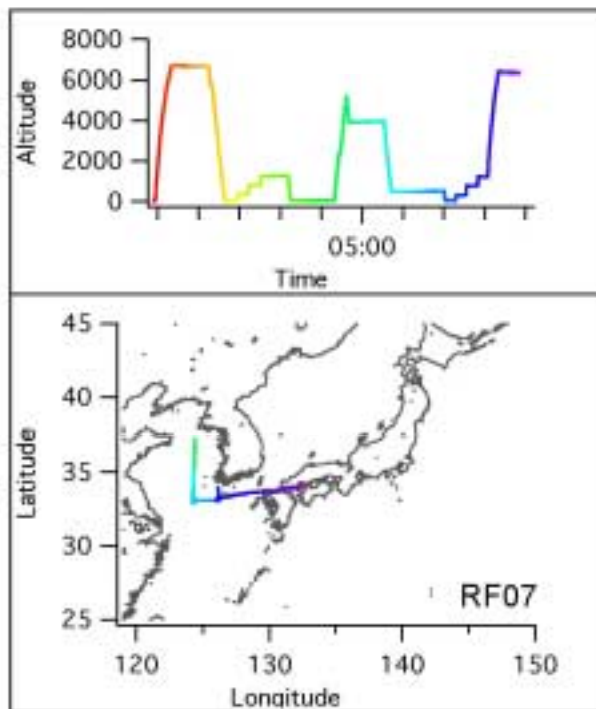
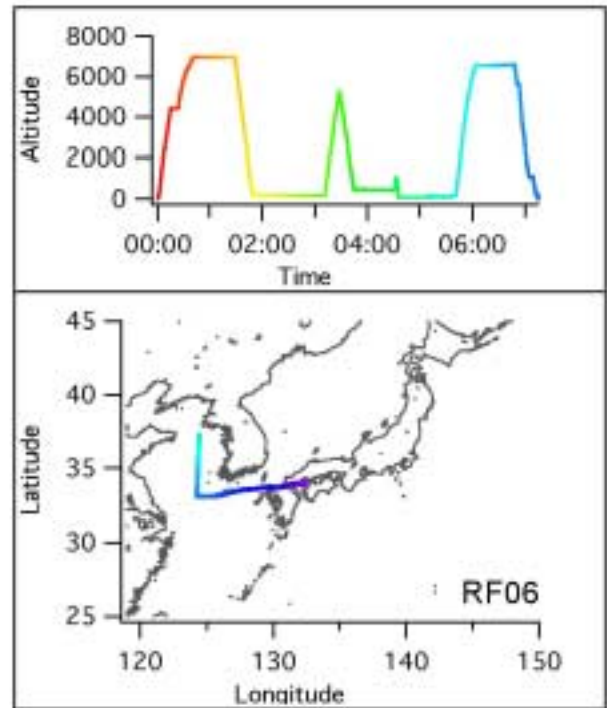
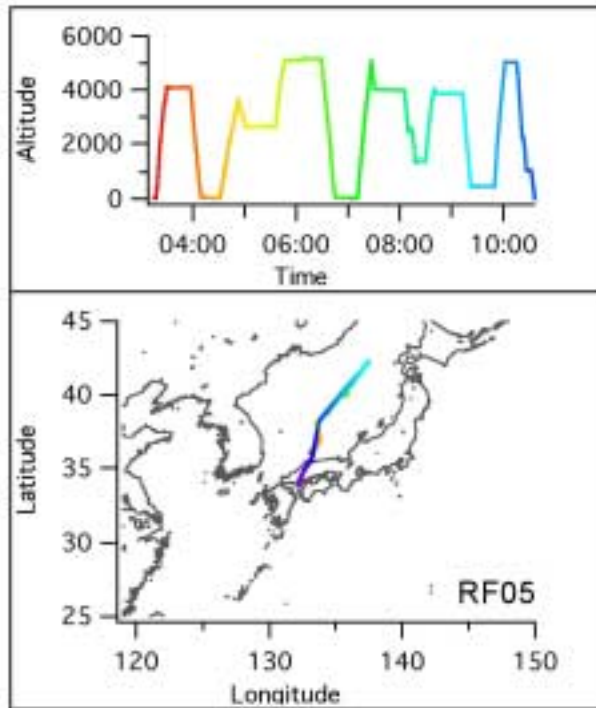
Composite of all C-130 flight tracks. Colors of the rainbow indicate time, with the earliest flight (RF01) in red and the last flight (RF19) in purple.



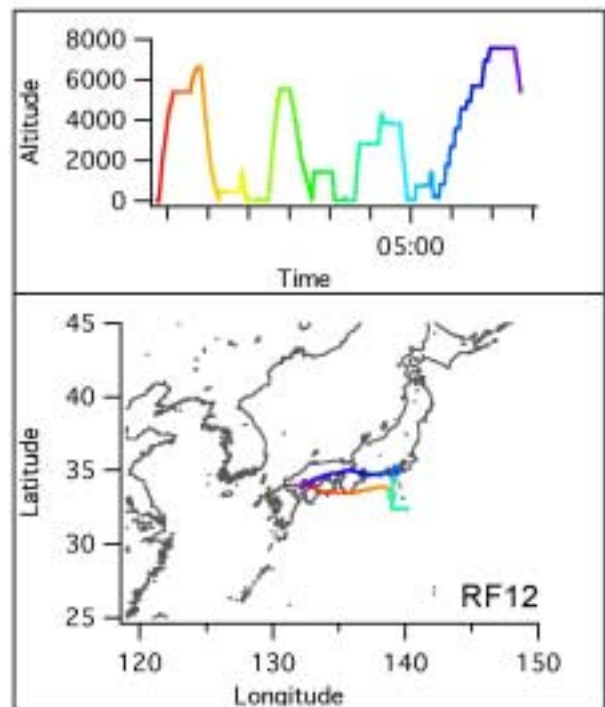
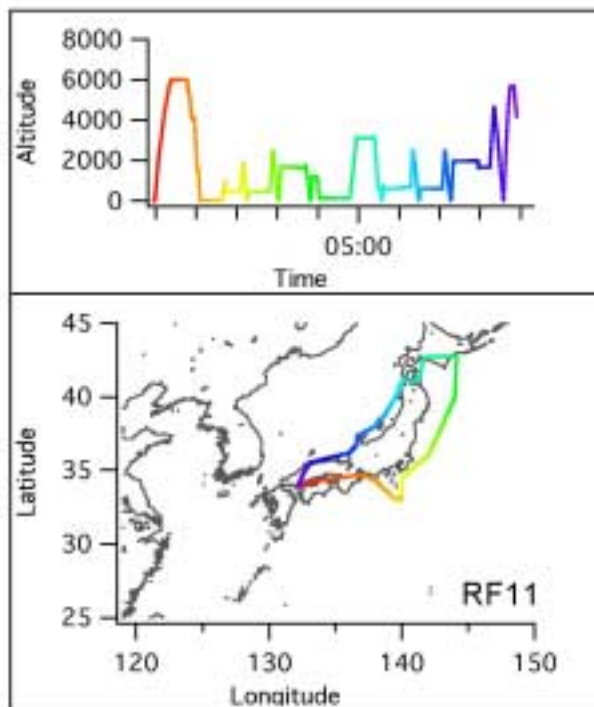
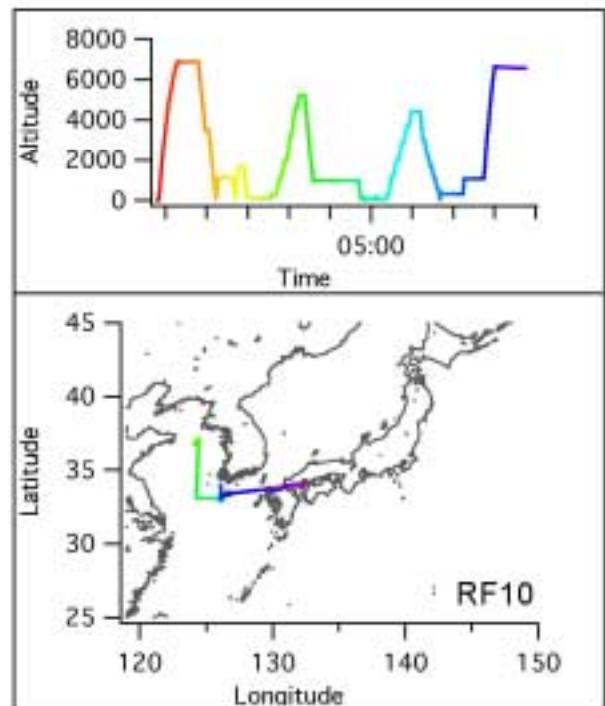
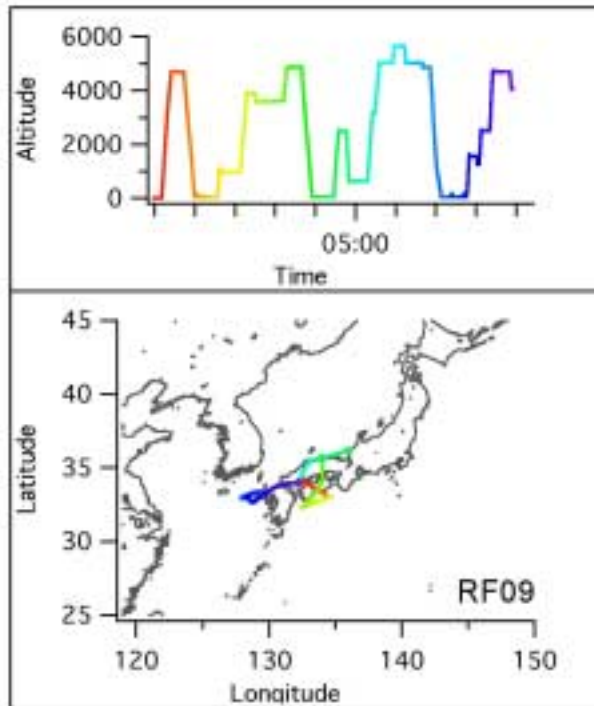
For the individual flight diagrams below, color indicates time through the flight. the same color scale applies to both the altitude/time plot and the track map for each flight.



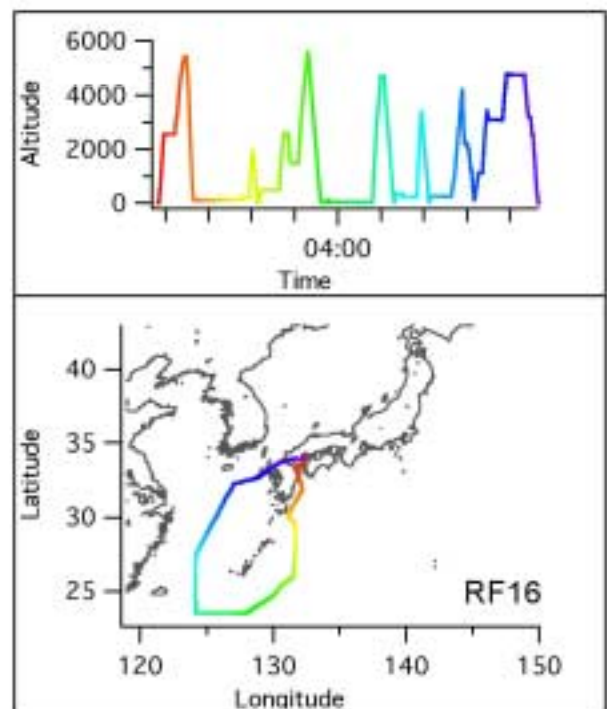
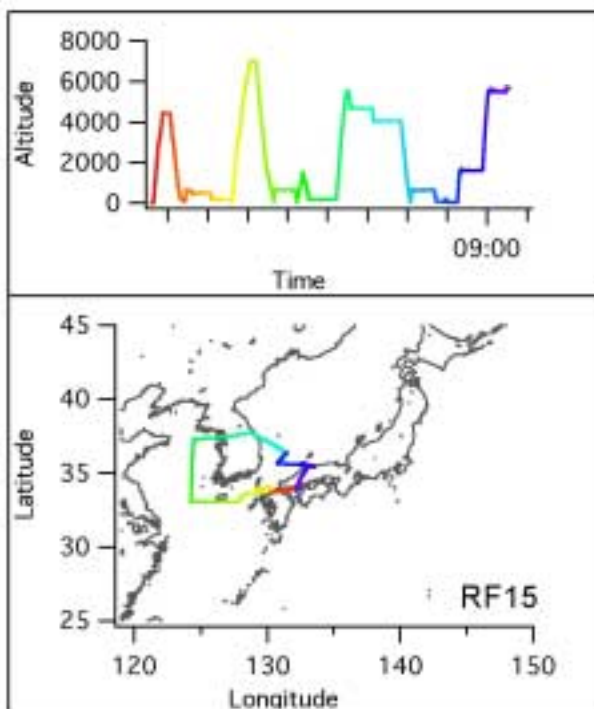
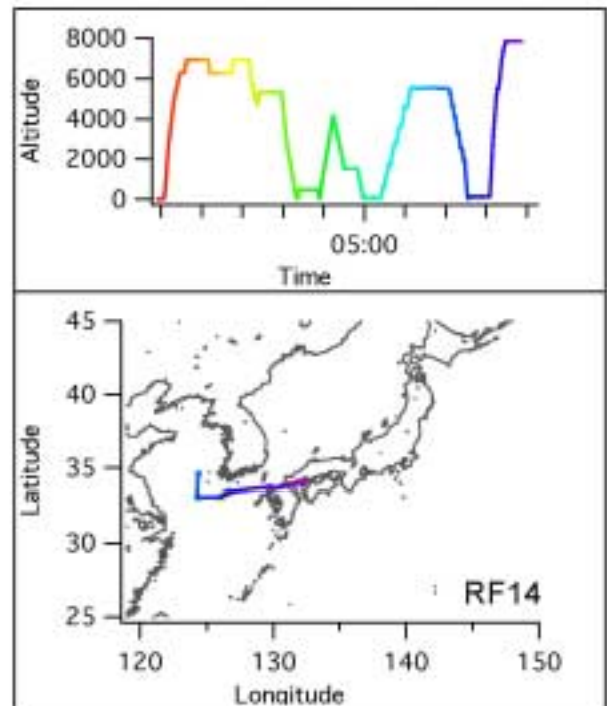
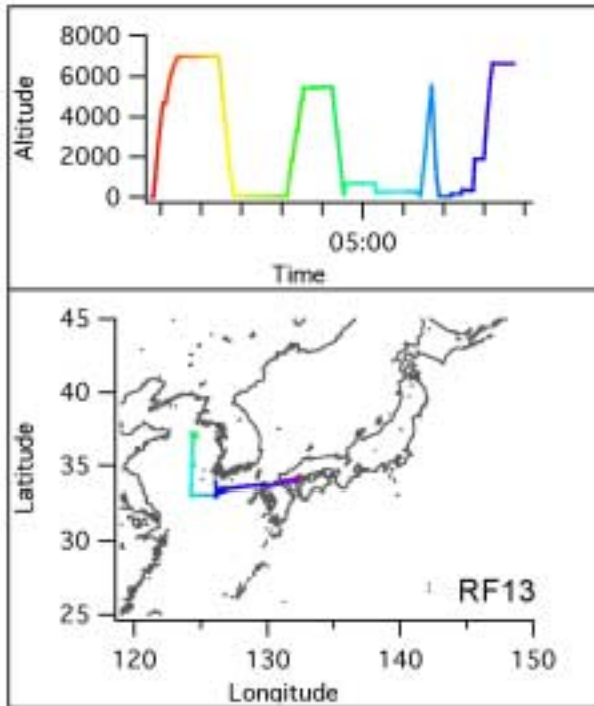
C-130 Flights 1 to 4



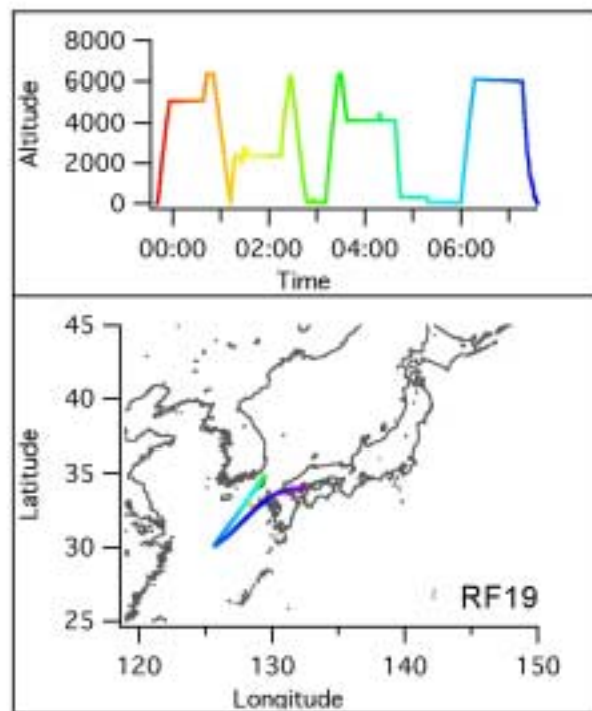
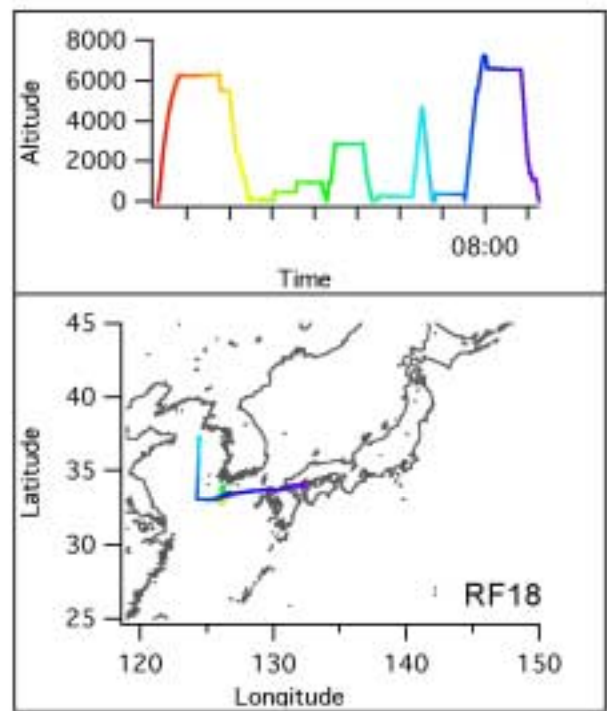
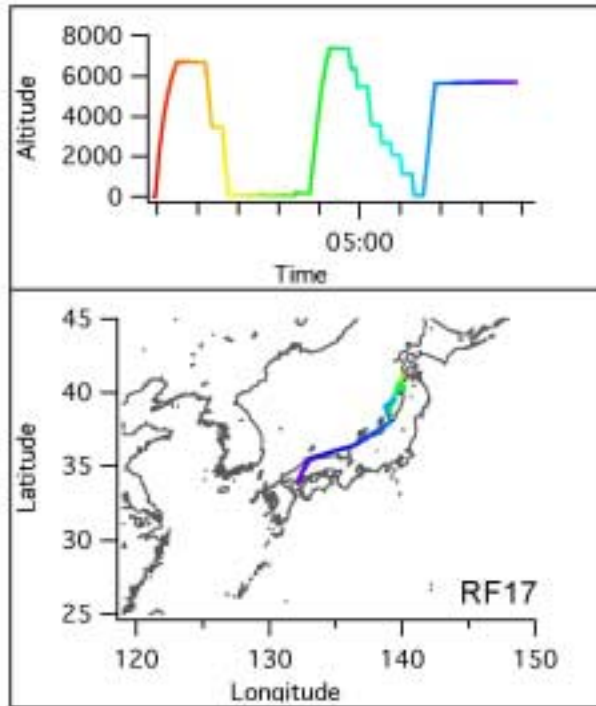
C-130 Flights 5 to 8



C-130 Flights 9 to 12



C-130 Flights 13 to 16



C-130 Flights 17 to 19

I.C. Table of C-130 flights and objectives

Flt #	Start date	Start time	End date	End time	Mission Scientist	Objectives and accomplishments
FF01	03/23	2103	03/24	0025	Huebert	ferry to San Jose, CA
FF02	03/25	0235	03/25	1128	Huebert	ferry to Honolulu, HI
FF03	03/27	2026	03/28	0420	Huebert	ferry to Wake Island
FF04	03/29	0233	03/29	1128	Huebert	ferry to Iwakuni, Japan
RF01	03/30	2340	03/31	0631	Huebert	-intercomparison with TRACE-P P-3 -MBL profile in Terra overpass near Kosan -observed location of Shanghai plume -characterized vertical extent of dust/aerosols
RF02	04/01	2344	04/02	0811	Huebert	-coordinated with TRACE-P near Terra overpass -sampled Chinese plume
RF03	04/04	0002	04/04	0857	P.Russell	-column closure w/Terra overpass (nr. Oki I) -intercomparison w/Ron Brown (s. of Japan) -aerosol chemical/physical/radiative characterization
RF04	04/06	0037	04/06	0943	Huebert	-intercomparison w/Kosan -investigated aerosol gradients in Yellow Sea
RF05	04/08	0317	04/08	1036	P.Russell	-intercomparison w/Ron Brown -sampled Perfect Storm dust/pollution in Sea of Japan -investigated dust/radiation gradients -sampled sulfate/organic pollution below dust
RF06	04/11	0001	04/11	0715	Huebert	-characterized mineral aerosol from Perfect Dust Storm
RF07	04/11	2355	04/12	0912	P.Russell	-radiation/aerosol measurements over Yellow Sea in heavy dust -intercomparison w/Kosan -column optical depth meas w/SeaWiFS
RF08	04/13	0016	04/13	0845	Clarke	-TERRA-MISR/Ron Brown intercomparison -Amami ground station intercomparison -Column closure -SeaWiFS/NOAA-16/14 satellite & model intercomparison -Chemical characterization
RF09	04/17	0010	04/17	0928	Huebert	-Ron Brown intercomparison -studied impact of Japan on aerosol loading in cross-island flow
RF10	04/17	2350	04/18	0900	P.Russell	-column optical depth w/ SeaWiFS overpass - -measured aerosols between low and high radiation gradient legs. -measurements at 4 altitudes west of Kosan
RF11	04/19	2358	04/20	0918	Huebert	-circled Honshu for comparison with regional

						transport models
RF12	04/22	2250	04/23	0810	L.Russell	-Radiation intercomparison at 30m w/ 4 satellite overpasses -characterization of aerosol chemical composition -Tokyo Lidar intercomparison with 5 ground-based lidars
RF13	04/23	2349	04/24	0909	Huebert	-measured heavy dust not predicted by CTM models in the Yellow Sea -Kosan intercomparison
RF14	04/25	0004	04/25	0918	P.Russell	-measured upwind/crosswind and vertical/temporal variations in aerosol properties near Kosan in MISR local mode -column closure measurements of aerosol properties in other satellite overpasses
RF15	04/27	0037	04/27	1010	L.Russell	-Upwind and Downwind of Korea chemical characterization -Intercomparison with Twin Otter -Radiation intercomparison at 30m w/ satellite overpass
RF16	04/29	2350	04/30	0839	Huebert	-impact of precipitation on the Shanghai plume -very clean tropical air -Intercomparison with Kingair
RF17	04/30	2357	05/01	0919	P.Russell	-measured radiative fluxes and optical depths across a predicted optical depth gradient off the NW coast of Japan -column closure measurements near several satellite overpasses -measured aerosol chemistry and physics
RF18	05/02	0021	05/02	0916	P.Russell	-measured upwind/crosswind, vertical, and temporal variations in aerosol near Kosan in MISR local mode - column optical depth and associated profile measurements of aerosol -measured aerosol chemistry and physics over the Yellow Sea
RF19	05/03	2341	05/04	0735	Huebert/ Valero	-measured a gradient of radiation due to an aerosol gradient - collected integrated samples of the aerosol causing those radiative effects
FF05	05/07	1347	05/07	2054	Huebert	-ferry to Wake Island -documented the spatial extent of dust and pollution in the Pacific FT
FF06	05/08	2158	05/09	0520	Huebert	-ferry to Honolulu -Characterized Central Pacific FT aerosols

I.D. Where to find C-130 data

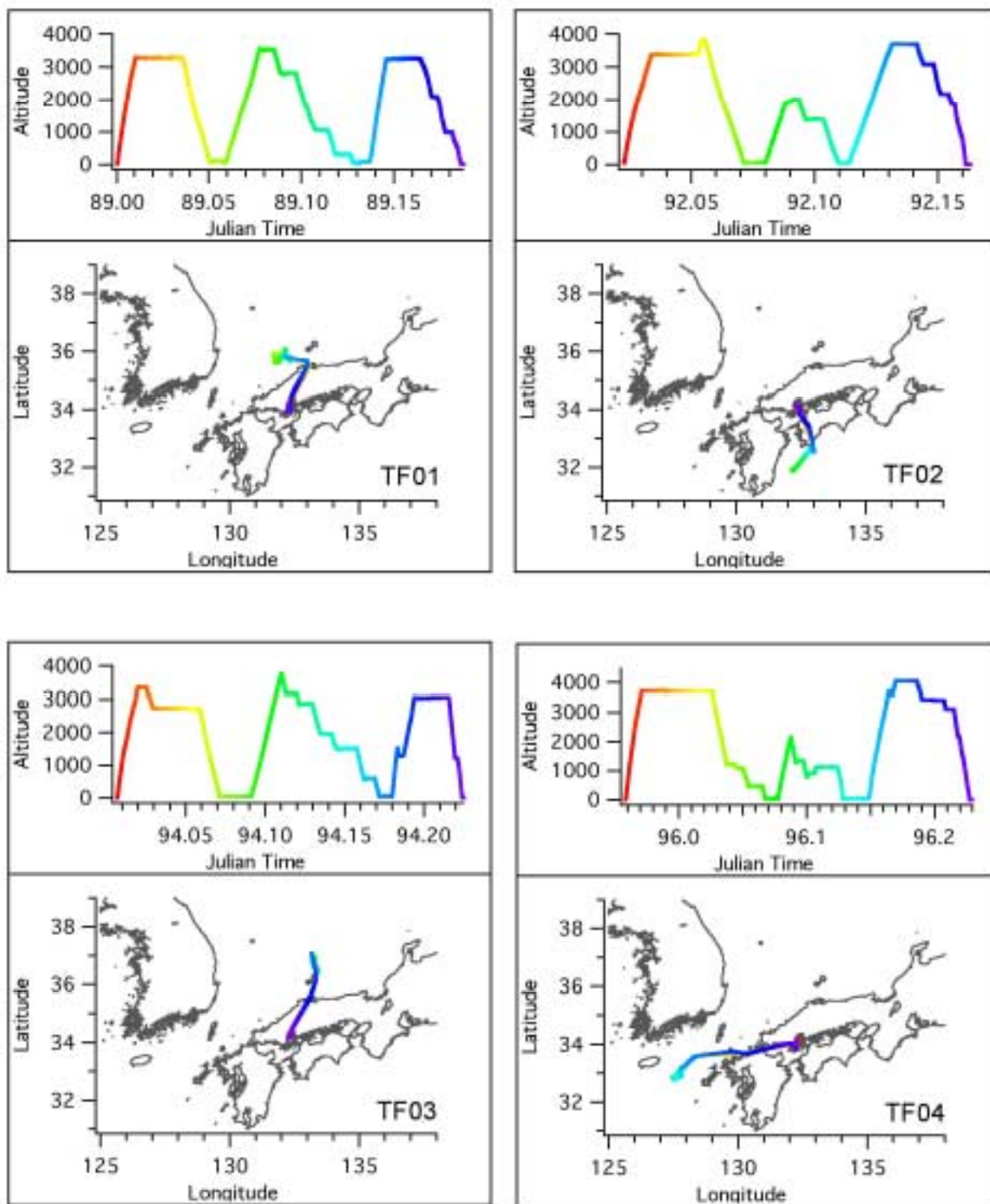
The C-130 data are publicly available at the ACE-Asia UCAR/JOSS Data Archive: <http://www.joss.ucar.edu/ace-asia/dm/>. Direct questions to Barry Huebert at huebert@hawaii.edu.

II. CIRPAS Twin Otter Aircraft

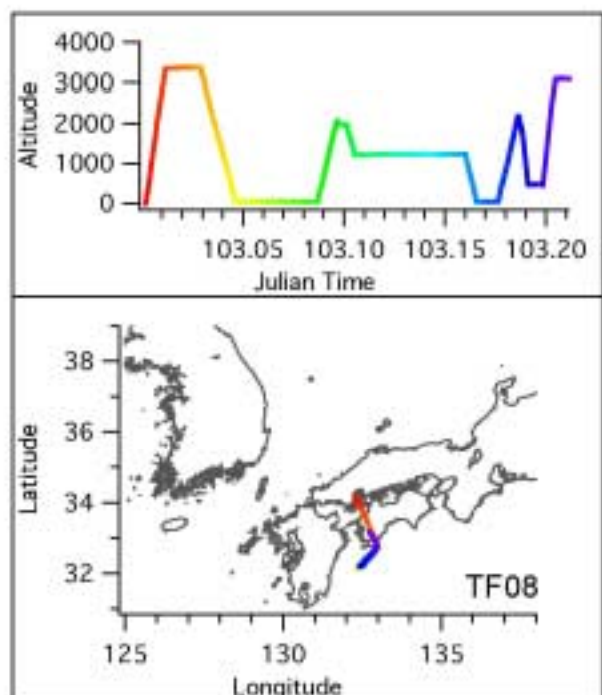
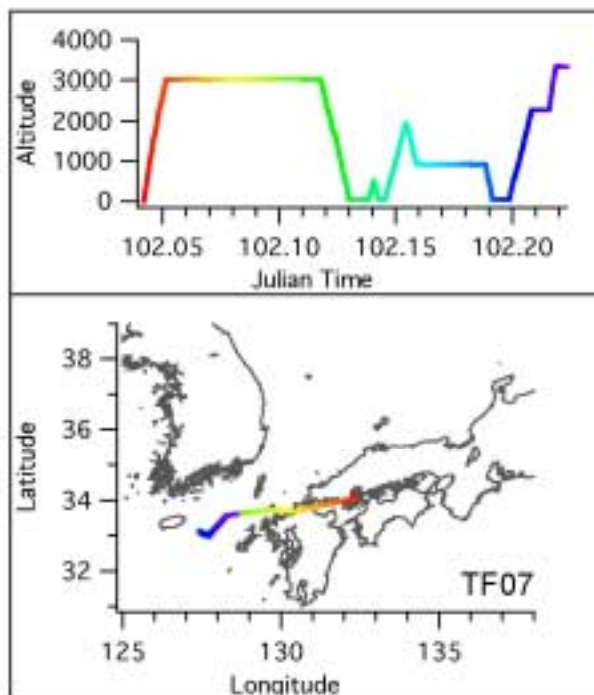
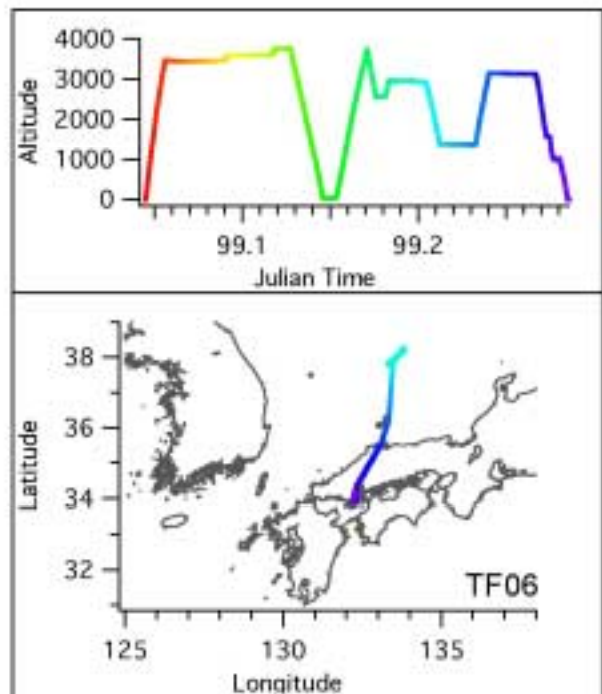
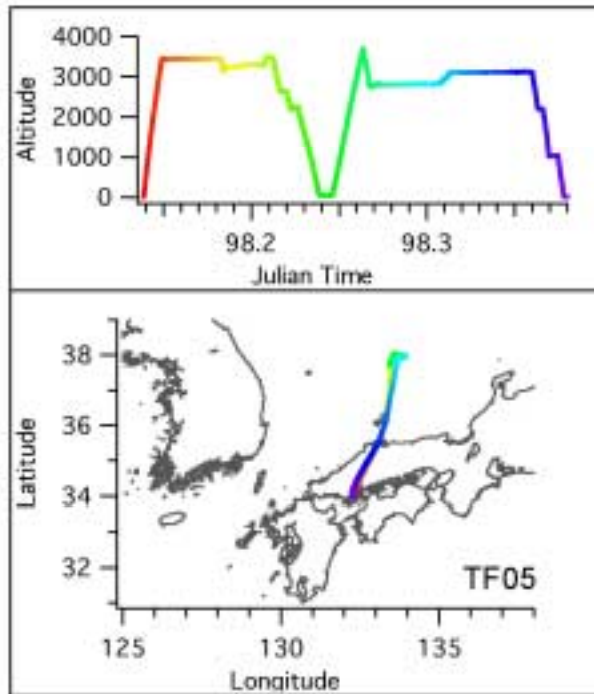
II.A. Twin Otter ACE-Asia Instruments and Participants

Parameter Measured	Instrument/Technique	PI	PI Institution
Organic/elemental carbon	Denuder/filter sampler	J. Seinfeld/R. Flagan	California Institute of Technology
Aerosol size and composition	Aerodyne Aerosol Mass Spectrometer	J. Seinfeld/R. Flagan	California Institute of Technology
Hygroscopic properties of aerosol	Tandem Differential Mobility Analyzer	D. Collins	Texas A&M University
Aerosol size distribution (dry and wet)	Differential Mobility Analyzer	J. Seinfeld/R. Flagan	California Institute of Technology
Aerosol optical thickness	14-wavelength NASA Ames Airborne Tracking Sunphotometer	P. Russell	NASA Ames
Radiative flux	Flux radiometer	P. Pilewskie	NASA Ames
Aerosol composition	Micro-Orifice Uniform Deposit Impactor	D. Hegg	University of Washington
Aerosol scattering	3-wavelength TSI Nephelometer	H. Jonsson	Naval Postgraduate School
Aerosol size distribution and number concentration	CAPS, PCAPS, FSSP, CNCs	H. Jonsson	Naval Postgraduate School
Aerodynamic partial size	TSI Aerodynamic Particle Sizer	J. Seinfeld/R. Flagan	California Institute of Technology

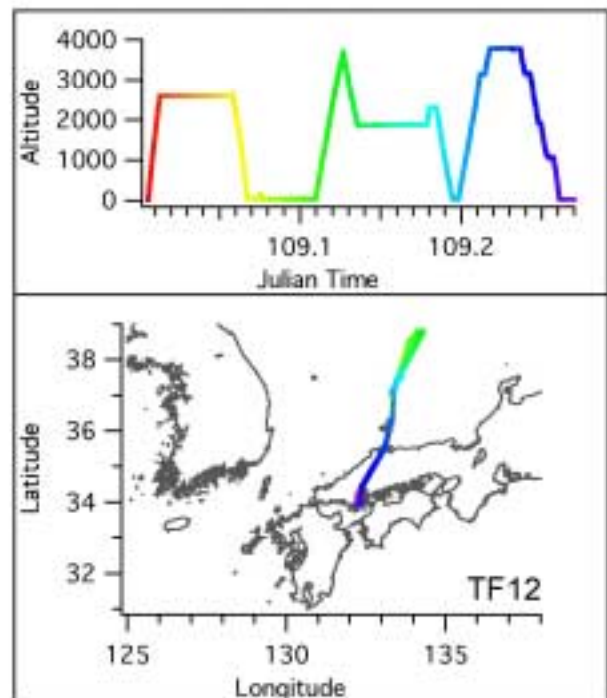
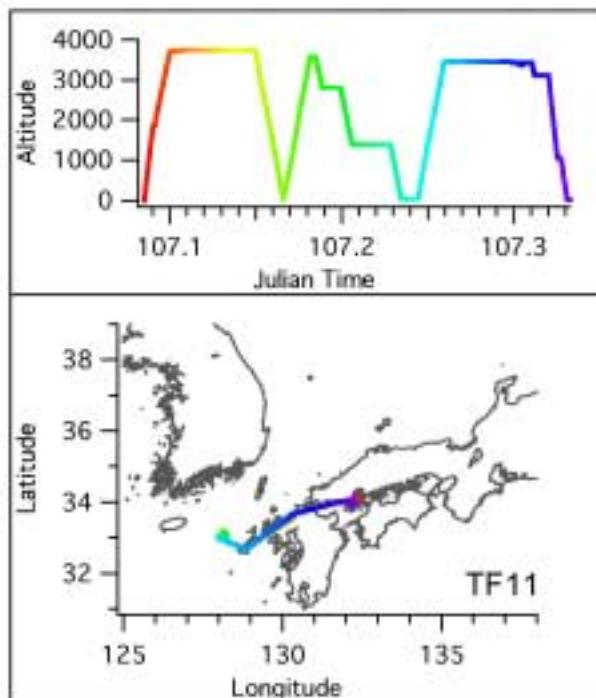
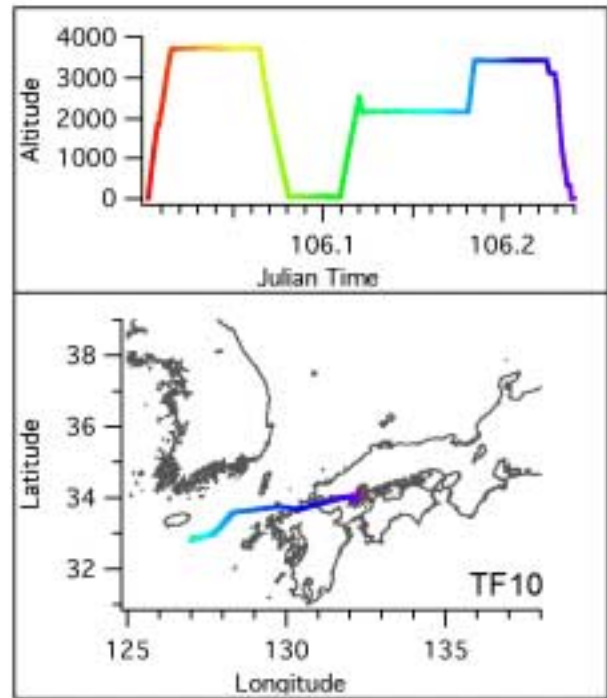
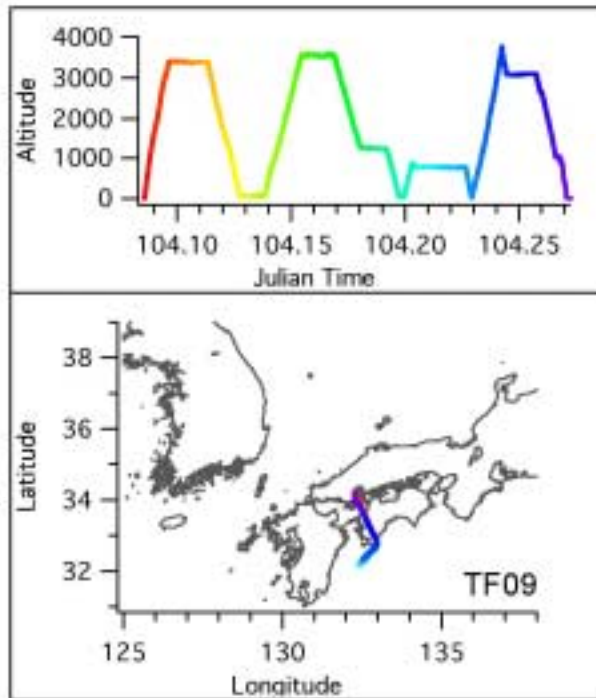
II.B. Twin Otter flights



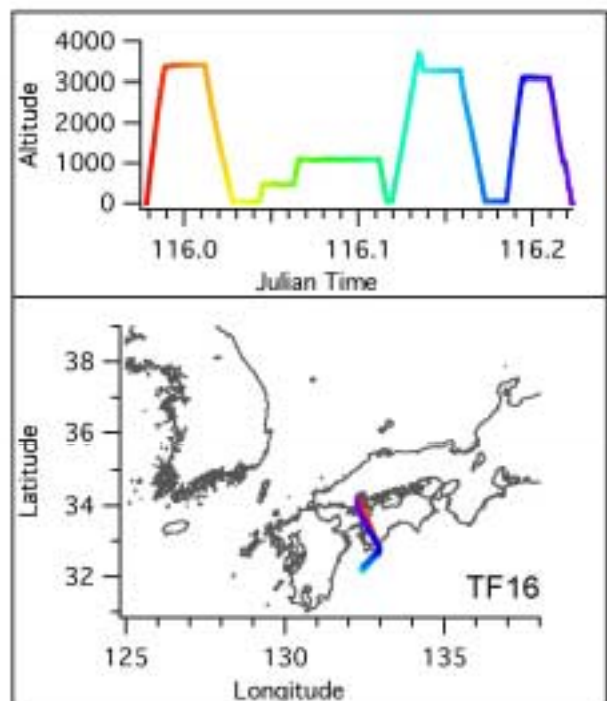
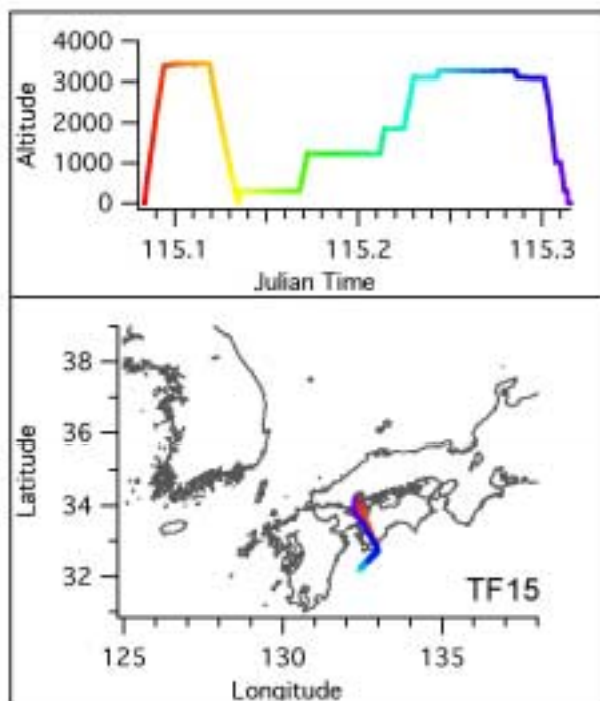
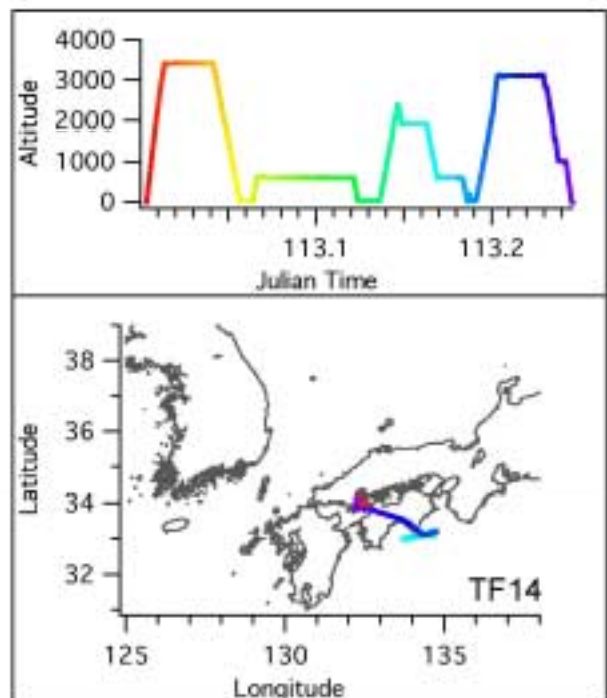
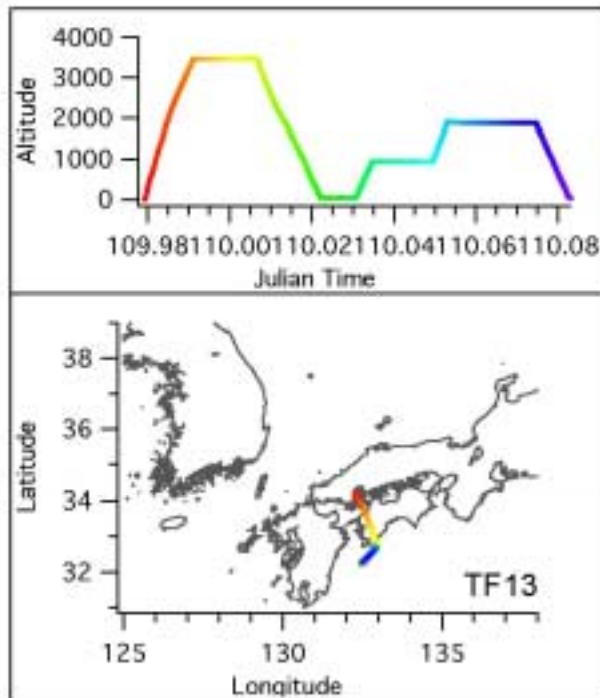
Twin Otter Flights 1 to 4



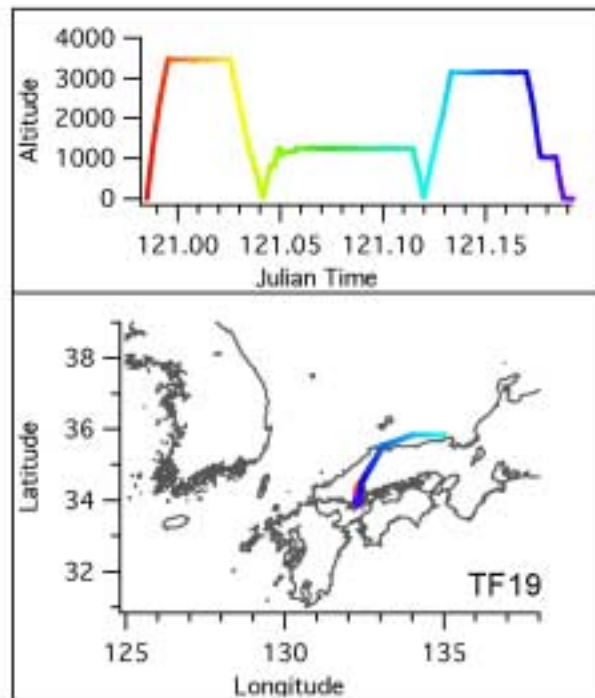
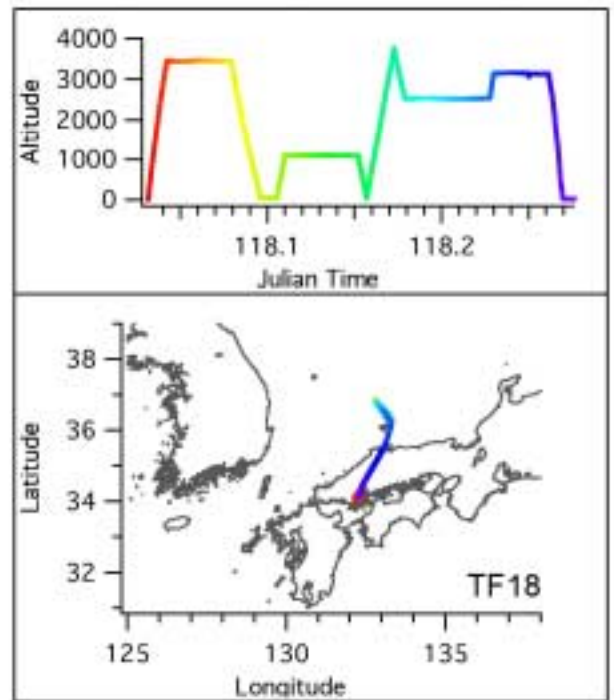
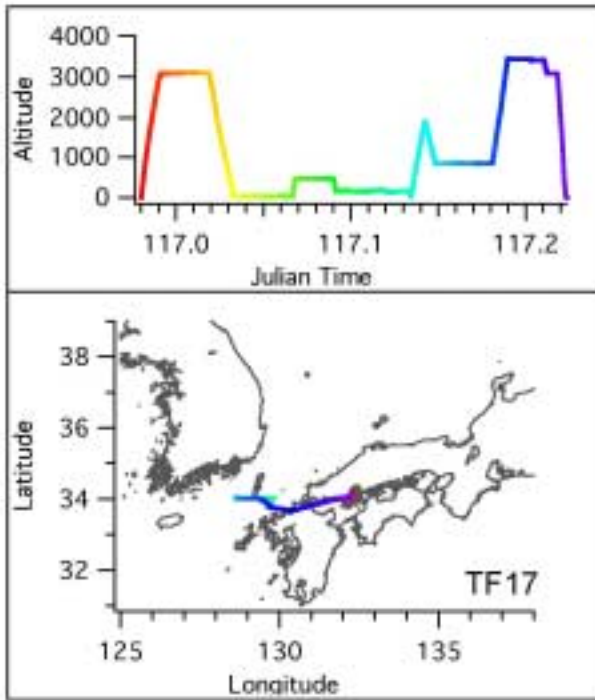
Twin Otter Flights 5 to 8



Twin Otter Flights 9 to 12



Twin Otter Flights 13 to 16



Twin Otter Flights 17 to 19

II.C. Table of Twin Otter Flights and Objectives

Flight Number	Date/Flight ID	Take Off Time	Return Time	Mission Summary
1	20010331	9:00	13:29	Fly legs over Sea of Japan North of Iwakuni in area between Oki island and S. Korea. Did a flat slant descent, spiraled up at 500 ft/min, sampled 4 layers upon second descent, good aerosol characterization but no direct scattering information from nephelometers.
2	20010402	9:30	12:53	Fly legs south of Iwakuni, Tansvector failed, latitude and longitude were recorded, some cirrus. Significant OC detected, no significant EC detected.
3	20010404	9:10	14:24	Fly legs over Sea of Japan NE of Oki island had perfect rendezvous with Terra satellite at 11:11 intercomparisons with C-130. Radiative closure candidate, but no Nephelometer no Moudi no TDMA. Significant OC detected, no significant EC detected.
4	20010406	8:00	14:29	Fly legs over Sea of Japan NE of Oki island, rendezvous with R/V Ron Brown @ lat 33 and long 127.4, Terra 10:58 (alt 3000') and SeaWifs 11:38 flyovers, Dust layer at 5000' sampled other layers at 1 km and 2 km, radiative closure candidate. Significant OC detected, no significant EC detected.
5	20010408	12:18	18:05	Fly legs over Sea of Japan NE of Oki island, transit along 133 to Oki island then rendezvous with R/V Ron Brown at 133.30 and 38, C-130 rendezvous with R/V Brown at 13:28. Layer at 7300', several layers visible. R/V Brown Lidar observes layers between 1 and 2 km and 2 and 3 km, sampled dust and pollution layers. Good dust flight, Prime closure candidate. During RF 5 the magnitude of the light scattering coefficient exhibited a dependence on wavelength at altitudes below 3000 m having a value of α between 1 and 2; it is likely that a significant fraction of aerosol particles in this layer had diameters $< 1 \mu\text{m}$. Above 3000 m, however, the magnitude of the light scattering coefficient was not a strong function of incident light wavelength. The derived value of $\alpha \gg 0.2$ suggests that light scattering was dominated by particles having diameters $> 1 \mu\text{m}$, and most likely mineral dust. Dust layers were encountered during sampling, OC levels were approximately $2.5 \mu\text{g-C m}^{-3}$ with EC concentration below the method detection limit, but likely less than $\gg 1.2 \mu\text{g-C m}^{-3}$.
6	20010409	10:04	15:51	Fly legs over Sea of Japan NE of Oki island, transit along 133 to Oki island then rendezvous with R/V Ron Brown at 133.30 and 38. Dust layer above 10,000 ft. Sulfate layer at 4500 ft sampled on way back. Cirrus may affect closure calculations. Dust layers were encountered during sampling, OC levels were approximately $2.5 \mu\text{g-C m}^{-3}$ with EC concentration below the method detection limit, but likely less than $\gg 1.2 \mu\text{g-C m}^{-3}$.

7	20010412	9:59	15:48	Fly legs in East China Sea just East of Cheju Island, rendezvous with R/V Ron Brown. Layer at 8000' below 5500' very high CN counts and large particles as well. Well mixed MBL. Primarily from the analysis of temperature and relative humidity profiles it was determined that sampling events conducted during RFs 7, occurred in the marine boundary layer (MBL). In RFs 7 the MBL was observed to be relatively clean, having an OC concentration $\gg 1.1 \mu\text{g-C m}^{-3}$ and EC levels below the method detection limit and likely less than $1 \mu\text{g-C m}^{-3}$. For RF 7, $\text{Å} \gg 1$ a value typically observed for relatively pristine marine aerosol [Delene and Ogren, 2002]. Significant amounts of CC were observed in samples collected over many different altitudes during RF 7 and not necessarily in the MBL.
8	20010413	9:01	14:40	Fly legs in Philippine Sea (South of Iwakuni) in an area East of Miyazaki Japan, Satellite rendezvous Sea Wifs 11:43, and 13:20, Terra at 11:11. Boundary layer at 6000 ft. Nothing above it but some variability within the layer. Computer failed on transit but data ok. Primarily from the analysis of temperature and relative humidity profiles it was determined that sampling events conducted during RF 8 occurred in the marine boundary layer (MBL). In RF 8 the MBL was observed to be relatively clean, having an OC concentration $\gg 1.1 \mu\text{g-C m}^{-3}$ and EC levels below the method detection limit and likely less than $1 \mu\text{g-C m}^{-3}$. For RF 8, $\text{Å} \gg 1$ a value typically observed for relatively pristine marine aerosol [Delene and Ogren, 2002].
9	20010414	11:02	15:32	Fly legs in Philippine Sea (South of Iwakuni) in an area East of Miyazaki Japan. Missed Terra at 11:48. Rendezvous with SeaWifs at 12:25 and NOAA 16 at 13:53. Stratocumulus affected sunphotometer. Dust at 8000' clean below. MBL at 3000' 26 knot winds at surface.
10	20010416	9:02	14:44	Fly legs in East China Sea South of Cheju Island. Get to 127 and 32. 11:37 Miser local overpass. PCAPS and CN were anti-correlated. Clean air clear sky, low optical depth.
11	20010417	11:01	16:58	Fly legs in East China Sea South of Cheju Island and due West of Nagasaki, rendezvous with R/V Ron Brown 33 N 128 W. Seawifs 12:54 at 100' at 12:58. No PCAPS. 12000' dust layer, Tansvector down during ferry to site but ok during sampling. Pollution layer at 4500' having high optical depth. Indicators of both dust and pollution were observed in the same layer. This conclusion was based on profiles of temperature, relative humidity, particle number concentration, scattering coefficient at 450, 550 and 700 nm, and Ångstrom exponent. A dust layer was present above 2200 m, Å for this layer was $0.24 (\pm 0.25)$. Sampling for carbonaceous aerosol was conducted at 1388 (± 30) m, and on the basis of the profile, apparently below the dust layer and near the bottom of a pollution plume. The level of OC and EC for this sample was below the MDL likely because

				sampling was conducted near the bottom of the plume and the sampling time was only 34 minutes. However, carbonate carbon (CC) was detected (Table 3), suggesting that mineral dust was in fact present although $\alpha = 1.1$, a value too high for a primarily dust layer, and too low for a primarily urban pollution layer. It is likely that during RFs 11 sampling was conducted in a layer consisting of a mixture of dust and pollution. These observations indicate significant levels of mineral dust can be present even though α is much greater than 0.25.
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12	20010419	9:10	15:17	Fly along 133 north of Oki island to 38 N, fly 1 hour legs at 100' and 6000'. An inversion at 6000' and a dust/pollution layer below inversion. Complete 3 spirals and two flat descents, good radiative data in gradients no cloud. Prime closure candidate. On RFs 12 indicators of both dust and pollution were observed in the same layer this conclusion was based on profiles of temperature, relative humidity, particle number concentration, scattering coefficient at 450, 550 and 700 nm, and Ångstrom exponent. Carbonate carbon (CC) was also present in the sample obtained in RF 12; however, the value of α between 1.5 and 1.9 suggests the presence of a pollution layer rather than a major dust layer. It is likely that during RF 12 sampling was conducted in a layer consisting of a mixture of dust and pollution. These observations indicate significant levels of mineral dust can be present even though α is much greater than 0.25.
13	20010420	8:29	11:55	Fly South to 32 and 132. Observe three layers each having humidities different by approx. 50% from each other, sample each layer for 30 min. Have MISR satellite rendezvous ok. Payload power was lost mid flight. Closure candidate.
14	20010423	9:21	14:55	Went East to 33 and 134. In dust on way out. Satellites MODIS at 10:03 at 7000' 12:16 Sea Wifs and NOAA 16, NOAA 16 at 13:54. Dust in upper levels and pollution layer low. Low winds. Great weather, clear sky. Closure candidate. Primarily from the analysis of temperature and relative humidity profiles it was determined that sampling events conducted during RF 14 occurred in the marine boundary layer (MBL). In RF 14 the MBL was observed to be relatively clean, having an OC concentration $\gg 1.1 \mu\text{g-C m}^{-3}$ and EC levels below the method detection limit and likely less than $1 \mu\text{g-C m}^{-3}$. For RF 14, $\alpha \gg 1.8$ and suggests the presence of anthropogenic aerosols [Sabbah et al., 2001; Vaughan et al., 2001; Delene and Ogren, 2002].
15	20010425	10:59	16:33	Fly South to Kyusyu, overcast with some stratocum, sunphotometer parked. First flight using Satcom.
16	20010426	8:28	14:22	Fly South to Kyusyu, SeaWifs overpass at 12:03. Completed 2 spirals. On the basis of particle number concentration, particle light scattering, and α values it was determined that carbonaceous aerosols were collected in pollution layers (some if which occurring the marine boundary layer during

				<p>RF 16 and 17) during RFs 16 and indeed values of α in these layers were $\gg 1.8$. For flights in pollution layers and for samples having OC and EC levels greater than the MDL, the OC and EC levels were on average $\gg 14$ and $1.3 \mu\text{g-C m}^{-3}$, respectively. The high TC/EC ratio observed for the pollution layers observed in RF 16, 17, and 18 suggest that biomass burning and/or SOA may have been important sources of the collected carbonaceous aerosols. We do not necessarily conclude that such sources dominate all pollution layers observed in this region since RF 16, 17 and 18 were conducted on successive days and back trajectories indicate that the airmasses all originated from same region of Mainland China [ACE-Asia Field Catalog, 2001] (the airmass encountered during RF 18 also spent time over South Korea). Excluding data from RF 16, 17, and 18 and samples where the levels of OC and EC were less than the MDL, but including samples collected in multiple atmospheric layers the average TC/EC ratio was 3.9. This value is lower than observed for RF 16, 17 and 18 and indicates a generally greater contribution of fossil fuel emissions to TC than was observed for RFs 16,17, and 18. Note: On the basis of estimated back trajectories observed during [ACE-Asia Field Catalog, 2001], an airmass containing carbonaceous aerosols typically took on the order of 1-2 days to travel from the sites of where carbonaceous aerosols were emitted, to the location where aerosol samples were collected. An important question is whether it is possible that the formation of SOA could have caused an increase in the TC/EC ratio during the time required to transport carbonaceous aerosol from the point of emission to the location where samples were collected. This amount of SOA cannot be accurately estimated at this time, and for this reason an estimate the relative amounts of TC from fossil fuel and biomass burning was not attempted.</p>
17	20010427	8:30	14:23	<p>Fly intercomparison with C-130 near Sashymia Island 34 N and 130 E. Terra overpass at 2:18. On the basis of profiles of temperature, relative humidity, particle number concentration, scattering coefficient at 450, 550 and 700 nm and α, we note that three reasonably well-defined layers were present below 3000 m. The layer present between 500 m and 1500 km had a significantly higher concentration of OC and EC than was observed in the marine boundary layer (MBL) present below 500 m. For this layer, the value of α was $1.61 (\pm 0.13)$, a value typical for an urban pollution layer, moreover modeled back trajectories suggest that this layer originated over Mainland China. We will designate this layer as a pollution layer. OC and EC concentrations in this layer, 28.9 and $1.62 \mu\text{g-C m}^{-3}$, respectively, were among the highest observed aboard the Twin Otter during ACE-Asia. (These measurements were not affected by a sampling error such as lab contamination, since blank levels were not significantly higher different than those on other days. Moreover, on this day similar levels of OC were observed in</p>

				the vicinity by those sampling aboard the NCAR C-130 [Huebert et al., Personal communication]. The ratio of TC/EC for the pollution layer observed in RF 17 was 18 and was the highest TC/EC ratio observed in this study. On the basis of a comparison of the TC/EC value for RF 17 to those from the literature, it is likely that the pollution layer observed during RF 17 originated from biomass burning rather than primary fossil fuel emissions. It is also possible that a significant portion of ambient carbonaceous aerosol mass may have also been SOA.
18	20010428	9:43	15:29	Fly along 133 north of Oki island to 36.5 N, fly approx 1 hour legs at 3000' and 8100'. Complete 1 spiral in clear area but some cirrus encountered, two good imapctor samples taken with MOUDI. From similar considerations, i.e. on the basis of particle number concentration, particle light scattering, and α values it was determined that carbonaceous aerosols were collected in pollution layers during RF 18 and indeed values of α in these layers were $\gg 1.8$. The high TC/EC ratio observed for the pollution layers observed in RF 18 suggest that biomass burning and/or SOA may have been important sources of the collected carbonaceous aerosols. We do not necessarily conclude that such sources dominate all pollution layers observed in this region since back trajectories indicate that the airmasses all originated from same region of Mainland China [ACE-Asia Field Catalog, 2001] (the airmass encountered during RF 18 also spent time over South Korea).
19	20010501	8:36	1:30	Fly along 133 northeast of Oki island to 36.5 N, and 134.5 E. Primarily sample one level at 3000' to load filter samples. Relatively clean air but much clouds above and fog in MBL.

II.D. Where to find Twin Otter data

The Twin Otter data are publicly available at the ACE-Asia UCAR/JOSS Data Archive: <http://www.joss.ucar.edu/ace-asia/dm/>. Direct questions to John Seinfeld at seinfeld@caltech.edu.

III. ARA Kingair

III.A. Table of Kingair instruments and participants

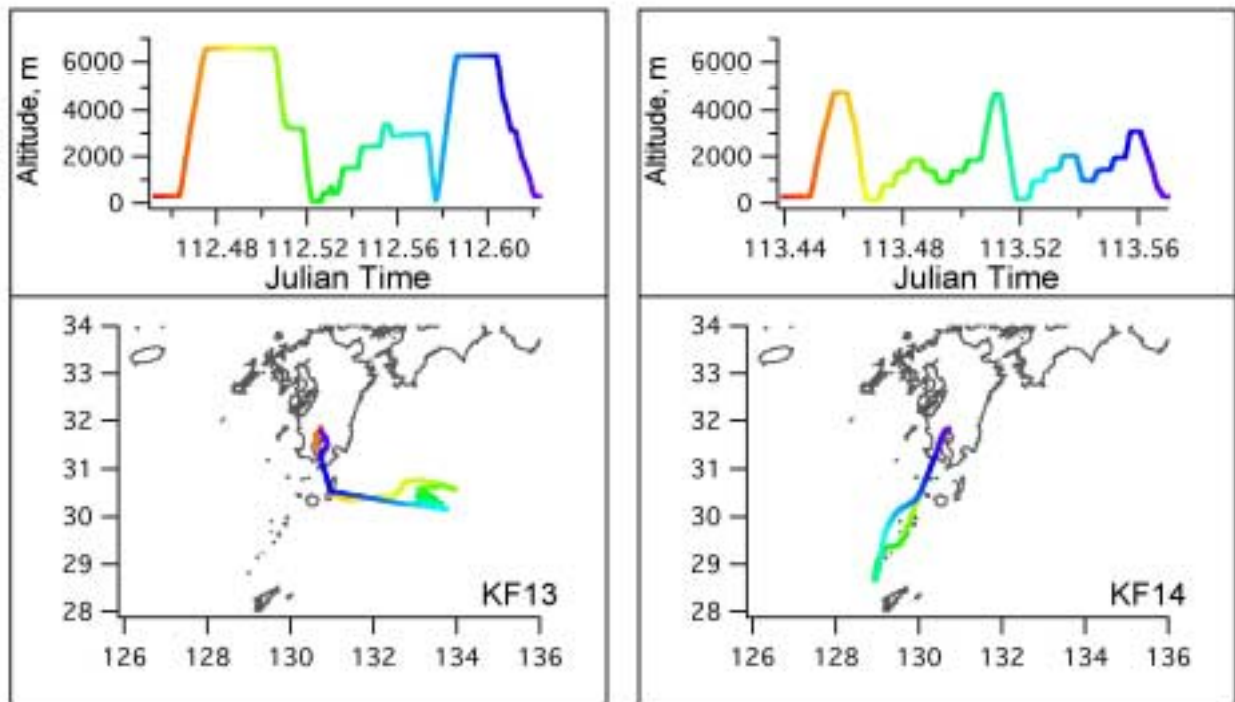
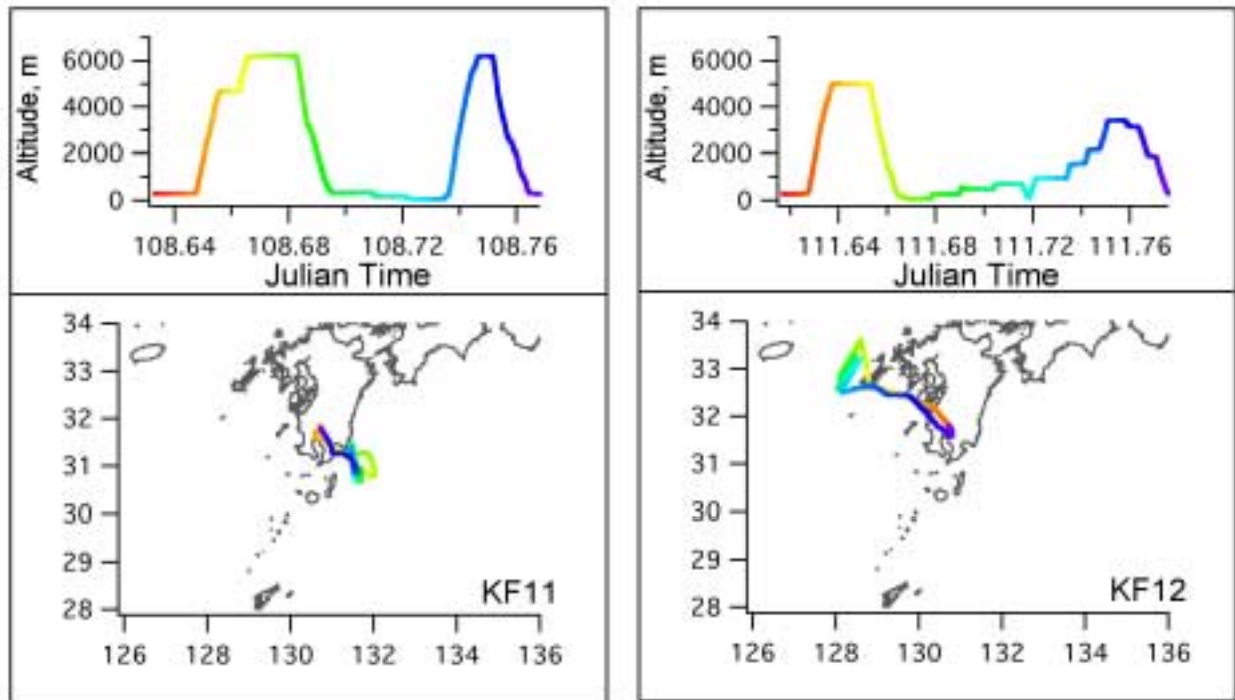
Standard parameters:			
Static pressure	Paroscientific	Jensen	CSIRO
Static pressure	Rosemount	Hacker	ARA
Differential pressure	Paroscientific	Jensen	CSIRO
Differential pressure	Rosemount	Hacker	ARA
Attack/sideslip	Rosemount	Hacker	ARA
Dry-bulb temperature	Rosemount	Jensen	CSIRO
Dry-bulb temperature	CSIRO reference	Jensen	CSIRO
Wet-bulb temperature	CSIRO reference	Jensen	CSIRO
Dewpoint temperature	Meteolab cooled mirror	Hacker	ARA
Dewpoint temperature	CSIRO cooled mirror	Hacker	ARA
Liquid water content	CSIRO King hotwire	Jensen	CSIRO
Liquid water content	DMT CAS	Uchiyama	MRI
Aerosol cloud and precip:			
Ultra-fine particles ($d > 2.5$ nm)	TSI 3025	Gras	CSIRO
Fine particles ($d > 10$ nm)	TSI 3010	Gras	CSIRO
Aerosol particles ($0.1 < d < 3$ mic)	PMS ASAP	Jensen	CSIRO
Giant aerosol ($d > 4$ mic)	CSIRO extern. impactor	Jensen	CSIRO
CCN spectrometer	3 ranges	Ishizaka	Nagoya U.
CCN counter	CSIRO	Gras	CSIRO
Cloud droplets ($1 < d < 23.5$ mic)	PMS FSSP	Jensen	CSIRO
Aerosol and cloud ($0.15 < d < 25$ mic)	DMT CAS	Uchiyama	MRI
Precipitation images ($d > 25$ mic)	PMS 2D-C	Jensen	CSIRO
Precipitation images ($d > 25$ mic)	DMT CIP	Uchiyama	MRI
Trace gases:			
Sulfur dioxide (SO ₂)	UV-pulse fluorescence	Uchiyama	Nagoya U.
Radiation:			
Remote temperature	BARNES PRT-5	Jensen	CSIRO
Short-wave flux (up/down)	Kipp & Zonen	Uchiyama	MRI
Near-infrared flux (up/down)	Kipp & Zonen	Uchiyama	MRI
Long-wave flux (up/down)	Eppley pyrgeometer	Hacker	ARA
Multi-wavelength flux (up/down)	Prede	Uchiyama	MRI
Microwave radiometer	Radiance Research	Uchiyama	MRI
Video:			
Forward	Panasonic	Jensen	CSIRO
Downward	Panasonic	Hacker	ARA

CSIRO = Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia

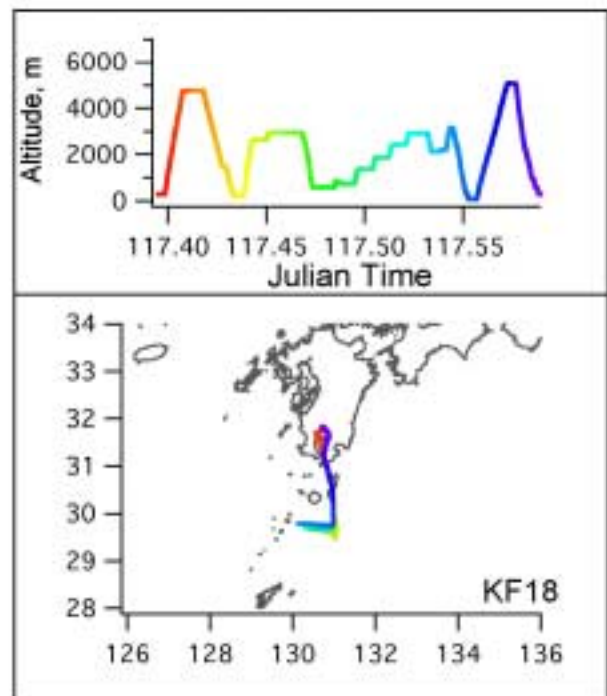
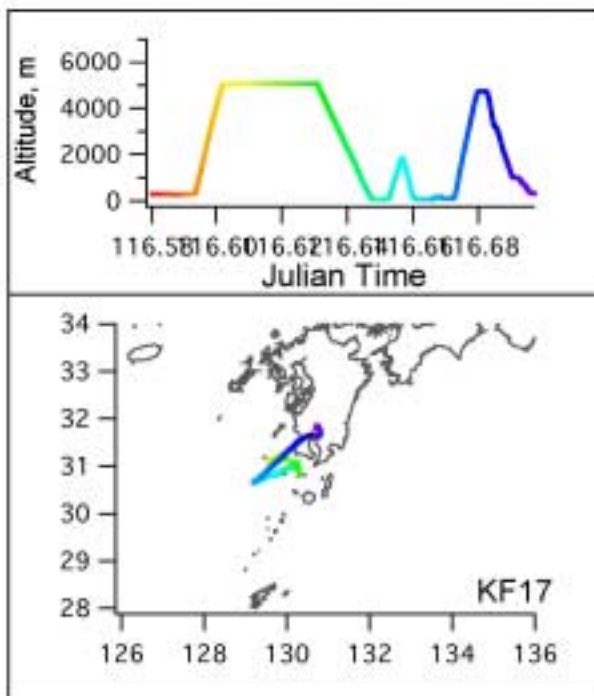
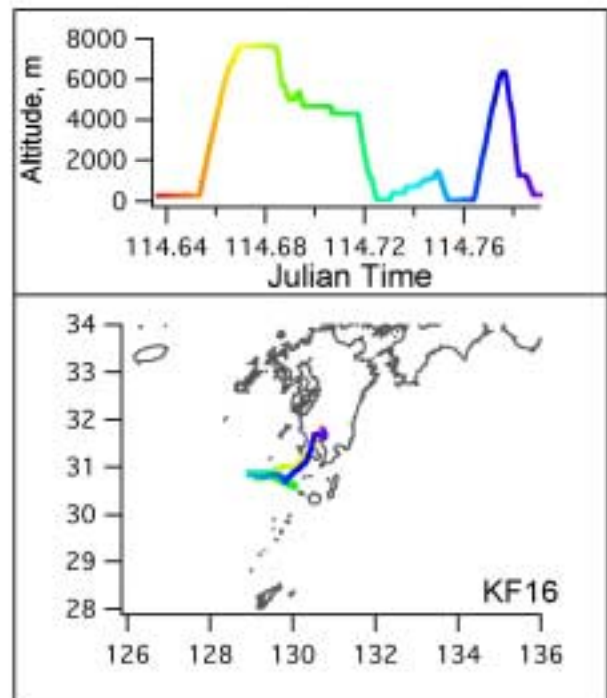
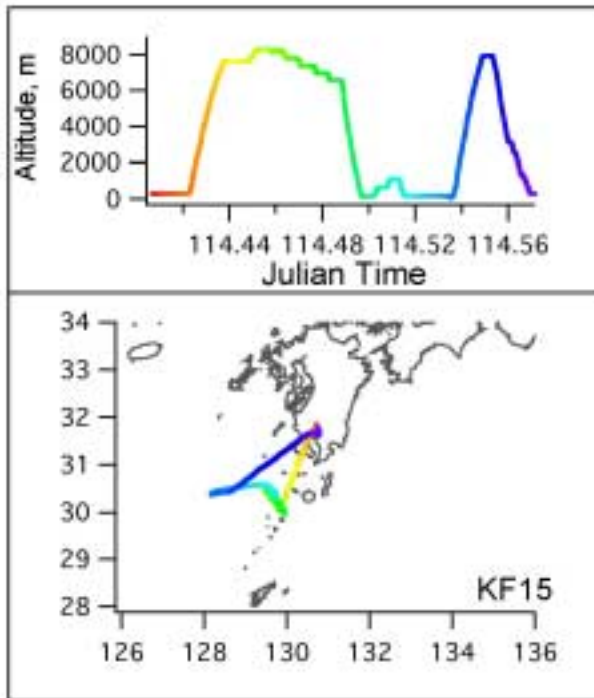
ARA = Airborne Research Australia, Adelaide, Australia

MRI = Meteorological Research Institute, Tsukuba, Japan

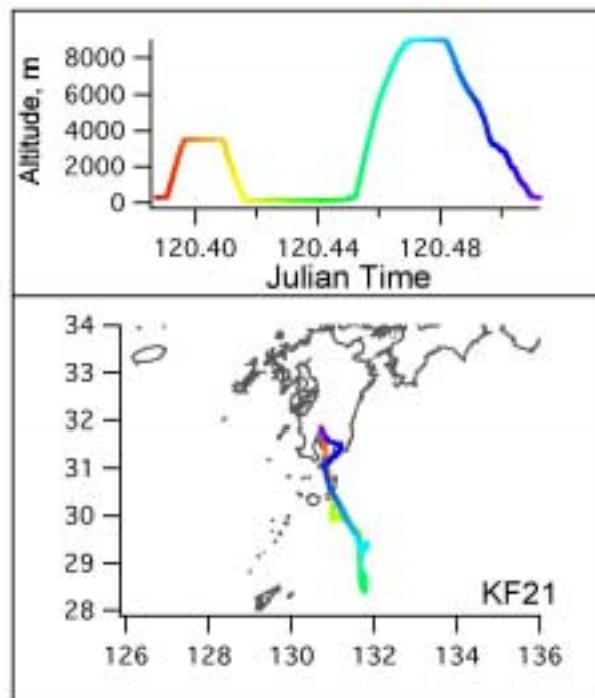
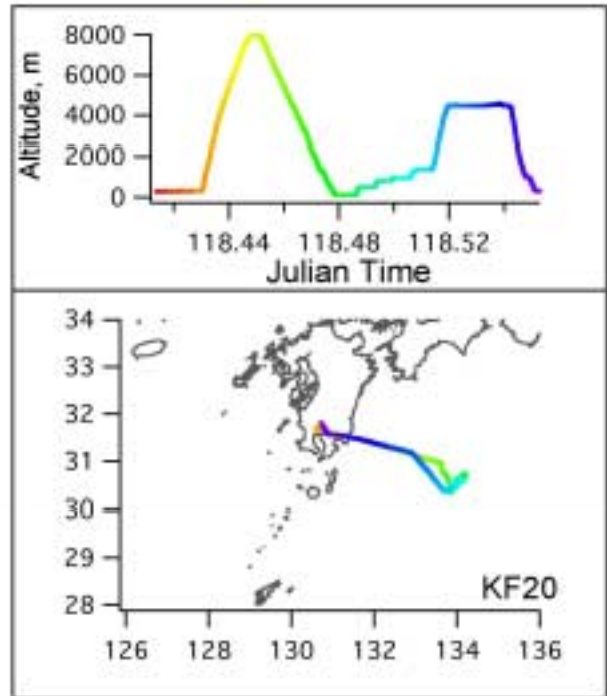
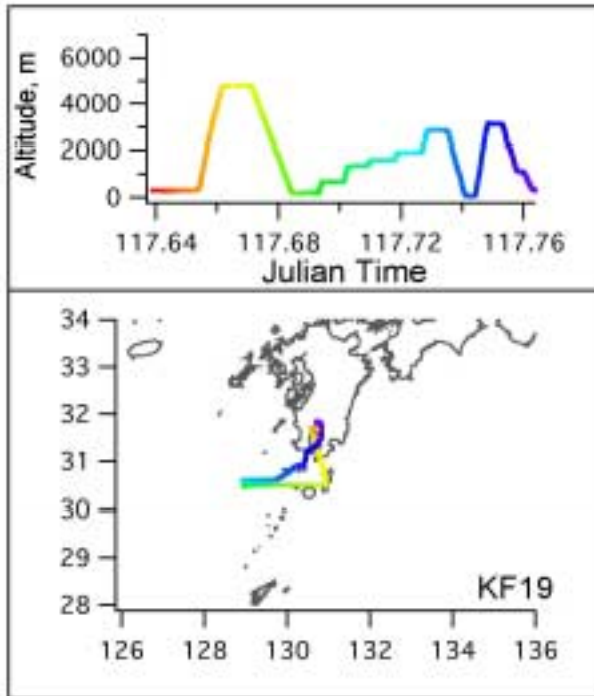
III.B. Figures of Kingair flight tracks



Kingair flights 11 to 14



Kingair Flights 15 to 18



Kingair Flights 19 to 21

III.C. Table of Kingair flights and objectives

Flt #	Start Date	Start Time JST	End Date	End Time JST	Mission Scientist	Objectives and accomplishments
KF11	04/18	1533	04/18	1821	Jensen	Ron Brown intercomparison
KF12	04/21	1504	04/21	1837	Jensen	Stratocumulus flight northwest of Kyushu
KF13	04/22	1108	04/22	1454	Jensen	Cumulus life-cycle study southeast of Kyushu
KF14	04/23	1045	04/23	1338	Jensen	Amami aerosol, cloud and radiation flight
KF15	04/24	1004	04/24	1340	Jensen	Pre-frontal and frontal flight
KF16	04/24	1541	04/24	1855	Jensen	Second frontal flight. Post-frontal and frontal
KF17	04/26	1415	04/26	1642	Jensen	Stratocumulus, dissipating, turning into radiometer calibration flight
KF18	04/27	0934	04/27	1408	Jensen	Marine stratocumulus southeast of Tanega-Shima island
KF19	04/27	1542	04/27	1819	Jensen	Stratocumulus and cumulus study
KF20	04/28	1020	04/28	1313	Jensen	Aerosol flight east of Kyushu
KF21	04/30	0923	04/30	1214	Jensen	Intercomparison with the NSF/NCAR C130

III.D. Where to find Kingair data

Data from the Kingair can be found at <http://www.joss.ucar.edu/ace-asia/> or from Jorgen Jensen jen137@ucar.edu or John Gras <john.gras@dar.csiro.au>.

IV. NOAA R/V *Ronald H. Brown*

IV.A. Table of *Ronald H. Brown* Measurements and Investigators

ACE-Asia Ronald H. Brown Measurements

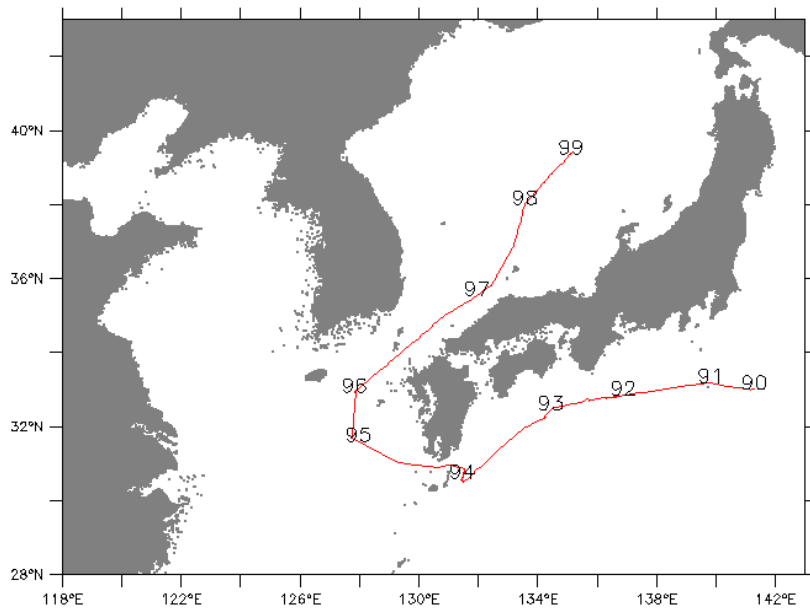
Parameter	Method	PI	Laboratory
<u>Aerosol Chemical Measurements</u>			
Aerosol composition, 2 stage (sub/super micron) & 7 stage at 55% RH	Impactors (IC, XRF and thermal optical OC/EC, total gravimetric weight)	Quinn & Bates	PMEL
Aerosol size and composition	Single particle MS	Prather & Guazzotti	UCSD
Sub-micron (55% RH) organic carbon functional groups and elemental composition	FTIR (with solvent rinsing) and XRF	Russell	Princeton
Fast (1hr) submicron (55%RH) OC/EC	Thermal/Optical	Turpin	Rutgers

Size distributions of mass (beta gauge), optical absorption - 9 wavelengths, elements Na to Zr: heavy metals	8 stage drum sampler at 55% RH	Cahill & Perry	UC Davis
Single particle analysis	SEM/TEM	Anderson	Arizona State
Lipid class compounds (dicarboxylic acids, hydrocarbons, fatty acids, alcohols, etc.)	GC & GCMS	Kawamura	Hokkaido University
<u>Aerosol Optical and Physical Measurements</u>			
Total and sub-micron aerosol light scattering & backscattering (400, 550 and 700 nm) at 55% RH	TSI 3563 nephelometer	Quinn	PMEL
Total and sub-micron aerosol absorption (550 nm)	Radiance Research PSAP	Quinn	PMEL
Aerosol number concentration	CPC and UCPC (TSI 3760, 3025)	Covert & Bates	UW & PMEL
Aerosol number concentration	CPC and UCPC (TSI 3010, 3025)	Wiedensohler	IFT
Aerosol number size distribution from 5 to 10,000 nm diameter at 55% RH	Twin DMPS and APS	Covert & Bates	UW & PMEL
Aerosol number size distribution from 5 to 10,000 nm diameter at <10% RH	Twin DMPS and APS	Wiedensohler	IFT
Aerosol number size distribution from 20 to 10,000 nm diameter at 10, 30, 55, 75, and 90% RH	Humidified DMA and Humidified APS	Wiedensohler	IFT
Hygroscopic growth for particles between 50-250 nm from <10% RH to 30, 55, 75, 90% RH	HTDMA	Wiedensohler	IFT
Hygroscopic growth (+ and -) for particles between 50-250 nm starting at 55% RH	HTDMA	Covert	UW
Hygroscopic growth for particles at 1000 nm	DMA- Humidified APS	Wiedensohler	IFT
Total and submicron (55%RH) light scattering and backscattering by aerosols at 3 wavelengths while scanning RH for increasing and decreasing conditions (f(RH))	Twin TSI 3563 nephelometers	Rood & Carrico	UI & Colorado State
<u>Column/Radiation Measurements</u>			
Aerosol optical depth, column ozone, water vapor	Microtops	Quinn, Flatau	PMEL, SIO
Aerosol vertical distribution	Micropulse Lidar	Welton & Spinhirne	U. MD & NASA/GSFC

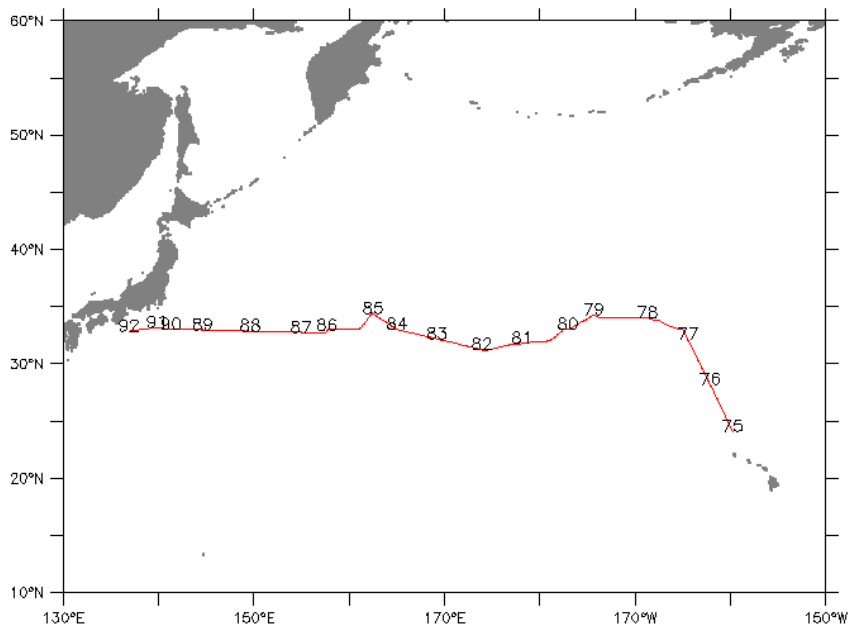
Water leaving radiance and aerosol optical thickness in 5 spectral bands	SIMBAD	Frouin	SIO
Aerosol optical thickness, single scattering albedo in the visible and near-infrared and aerosol size distribution	PREDE sunphotometer-skyradiometer	Frouin & Nakajima	SIO & U. Tokyo
Direct-beam normal irradiance, diffuse irradiance, total irradiance, aerosol optical thickness	fast-rotating shadowband radiometer and Eppley Pyrgeometer	Miller & Reynolds	BNL
Sky images	total sky imager	Miller & Reynolds, Minnett	BNL, UM
Irradiance	Kipp & Zonen Pyranometer: broadband, hemispheric view; BSI PAR radiometer, ASD spectral radiometer	Flatau	SIO
Irradiance	BSI PRR-810 19 spectral channels 312-875 nm	Mitchell	SIO
IR sky radiance	M-AERI (FTIR spectral radiometer)	Minnett	UM
<u>Trace Gas Measurements</u>			
Ozone	UV absorbance	Johnson	PMEL
CO	GC-Hg bed detector	Johnson	PMEL
Radon	Radon gas decay	Johnson & Zahorowski	PMEL, ANSTO
NMHC	GC	Chen	Academia Sinica
SO ₂	Pulsed fluorescence	Bates	PMEL
Seawater and atmospheric DMS	GC-SCD	Bates	PMEL
Seawater and atmospheric pCO ₂	Non-dispersive IR	Wanninkhof	AOML
<u>Ocean Biology and Optics</u>			
Downwelling Irradiance, Upwelling Irradiance, Upwelling Radiance, continuous profiles	BSI PRR-800 19 spectral channels 312-710 nm	Mitchell	SIO
Photosynthetic Pigments, discrete depths	HPLC	Mitchell	SIO
Particle and Soluble absorption, discrete depths	Discrete sample spectrophotometry	Mitchell	SIO
Photosynthetic Rates	14-C- bicarbonate tracer	Mitchell	SIO
Nutrients, discrete depths	Spectrophotometric autoanalyzer	Mitchell	SIO

IV.B. Ronald H. Brown Cruise Tracks

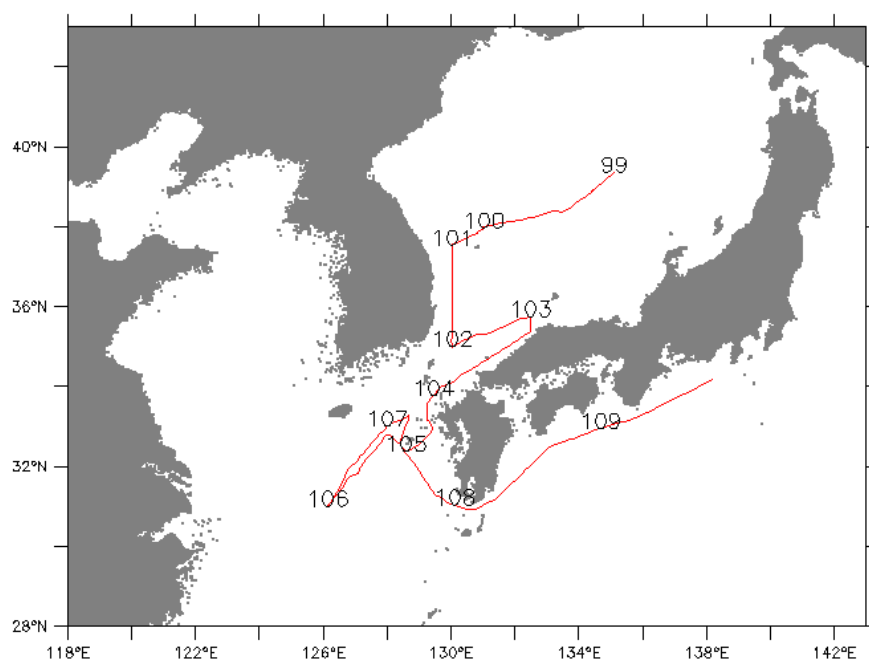
ACE ASIA — RONALD H. BROWN Cruise Track



ACE ASIA — RONALD H. BROWN Cruise Track



ACE ASIA — RONALD H. BROWN Cruise Track



IV.C. Ronald H. Brown Locations and Activities

Date	time (DOY)	location	objectives
16 Mar - 25 Mar	75-84.25	N. Pacific (2200-5900 km from Japan)	Characterize airmasses that had not been in contact with the continent for the past 6 days (background air)
25 Mar - 29 Mar	84.25-88.75	N. Pacific (500-2200 km from Japan)	Characterize continental air associated with passing fronts
29 Mar - 1 Apr	88.75-91.0	East of Japan (<500 km)	Characterize Miyakejima volcano
31 Mar - 1 Apr	90.5-91.5	Offshore Hachijo	Intercomparison
1 Apr - 3 Apr	91.0-93.5	South coast of Japan	Characterize mixed Asian outflow
3 Apr - 6 Apr	93.5-96.5	E. China Sea/Korean Strait	Characterize mixed Asian outflow
4-Apr	94.24	SE of Japan	Intercomparison with C130
6-Apr	96.15	Korean Strait	Intercomparison with TO
6 Apr - 10 Apr	96.15-100.5	Sea of Japan	Characterize polluted airmasses from Japan and mixed Japan/Miyakejima airmasses
8-Apr	98.19	Sea of Japan	Intercomparison with C130
8-Apr	98.25	Sea of Japan	Intercomparison with TO
10 Apr - 13 Apr	100.5-103.4	Sea of Japan	Characterize polluted airmasses mixed with dust
13-Apr	103.09	Sea of Japan	Intercomparison with C130

13 Apr - 14 Apr	103.4-104.2	Korean Strait	Characterize polluted airmasses mixed with dust
14 Apr - 17 Apr	104.2-107.5	East China Sea	Characterize mixed Asian outflow
16-Apr	106.11	East China Sea	Terra/MIRS overpass
17-Apr	107.25	East China Sea	Intercomparison with TO
17-Apr	107.3	East China Sea	Intercomparison with C130
17 Apr - 19 Apr	107.7-109.5	South coast of Japan	Characterize mixed Asian outflow
18-Apr	108.3	South coast of Japan	King Air Intercomparison

IV.D. Where to find *Ronald H. Brown* data

The *R/V Ronald H. Brown* data are publicly available on the UCAR/JOSS ACE-Asia data archive, <http://www.joss.ucar.edu/ace-asia/dm/>. Direct questions to Tim Bates at tim.bates@noaa.gov.

V. JAMSTEC R/V Mirai

V.A. Table of instruments and participants

Element	Method	PI	Inst.
Atmospheric Chemical Measurements			
Hi-vol air sampler and MOUDI impactor for water soluble organic compounds	GC/FID and GC/MS	Kawamura	ILTSa
Water soluble organic carbon (WSOC)	carbon analyzer (TOC-5000)	Kawamura	ILTSa
Lipid class compounds (hydrocarbons, fatty acids, alcohols, etc.)	GC and GC/MS	Kawamura	ILTSa
Non-methane hydrocarbons	In situ GC analyses	Kawamura	ILTSa
water soluble and trace metal and carbon	Low-volume sampling	Ohta	HU
Major inorg. Ions & trace metals	HVDVI sampling	Uematsu	ORI
Major inorg. Ions	Andersen type impactor	Uematsu	ORI
CO	IR absorption (Thermo Environmental Instruments, Model 48C)	Kajii	TMU
O ₃	UV absorption (Thermo Environmental Inst., Model 49C)	Kajii	TMU
SO ₂	UV luminescence (Thermo Environmental Instruments, Model 43C Trace Level)	Kajii	TMU
NO, NO _x	Chemiluminescence (Thermo Environmental Instruments, Model 42S)	Kajii	TMU
VOC	Silcosteel canisters (Restek) sampling, GC-FID and GC/MS	Kajii	TMU
DMS	Cryogenic sampling and GC/FPD	Nagao	NU
Elemental composition of individual particles (surface and upper, Kytoon observation)	impactor, SEM/EDX	Miura	SUT
Radon and Thoron concentrations	Radon and Thoron monitor	Miura	SUT
Aerosol Physical and Optical			

Measurements

Size distribution	OPC (RION KC18, KC01)	Uematsu	ORI
Size distribution	SMPS (3936N25), OPC(RION KC01)	Miura	SUT
Vertical profile of size distribution	Kytoon observation, OPC (RION KC12)	Miura	SUT
Scattering coefficient	Integrating nephelometer (M903, Radiance Research)	Ohta	HU
Absorption coefficient	PSAP (Radiance Research)	Ohta	HU
Vertical Profile of backscattering (532 and 1064 nm) and depolarization (532 nm)	Mie dual-polarization lidar	Sugimoto	NIES

Radiation Measurements

Optical thickness and volume distribution in column	Sky radiometer (Prede)	Endo	ILTSb
Optical thickness	Portable Sunphotometer	Miura	SUT
cloud base and top heights, vertical profiles of backscattering coefficients, vertical profiles of Doppler velocity	95-GHz cloud profiling radar	Kumagai	CRL
Liquid water path, column amount of water vapor	Microwave radiometer	Kumagai	CRL
Shortwave irradiance(W/m ²)	Precision Spectral Pyranometer	Yoneyama	JAMSTEC
Longwave irradiance(W/m ²)	Precision Infrared Radiometer	Yoneyama	JAMSTEC
Direct and Diffuse Irradiance (W/m ²)	Fast Rotating Shadowband Spectral Radiometer	Yoneyama	JAMSTEC
Sky Images, Cloud Faction	Total Sky Imager	Yoneyama	JAMSTEC

Meteorological Measurements

Surface elements	routine
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Sea Water Measurements

DMS	Cryogenic sampling and GC/FPD	Nagao	NU
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Organizations & PIs

R/V Mirai MR01-K2 2001.5.14-28

**Eastern Ocean of Japan Islands
(30-40N, 140-160E)**

Participating Organizations

Institute of Low Temperature Science, Hokkaido University (ILTSa)

Institute of Low Temperature Science, Hokkaido University (ILTSb)

Faculty of Engineering, Hokkaido University (HU)

Ocean Research Institute, University of Tokyo (ORI)

Faculty of Engineering, Tokyo Metropolitan University (TMU)

Faculty of Science, Science University of Tokyo (SUT)

PI

Kimitaka Kawamura

Tatsuo Endo

Sachio Ohta

Mitsuo Uematsu

Yoshizumi Kajii

Kazuhiko Miura

Graduate School of Environmental Studies, Nagoya
University (NU)

Ippei Nagao

National Institute for Environmental Studies (NIES)

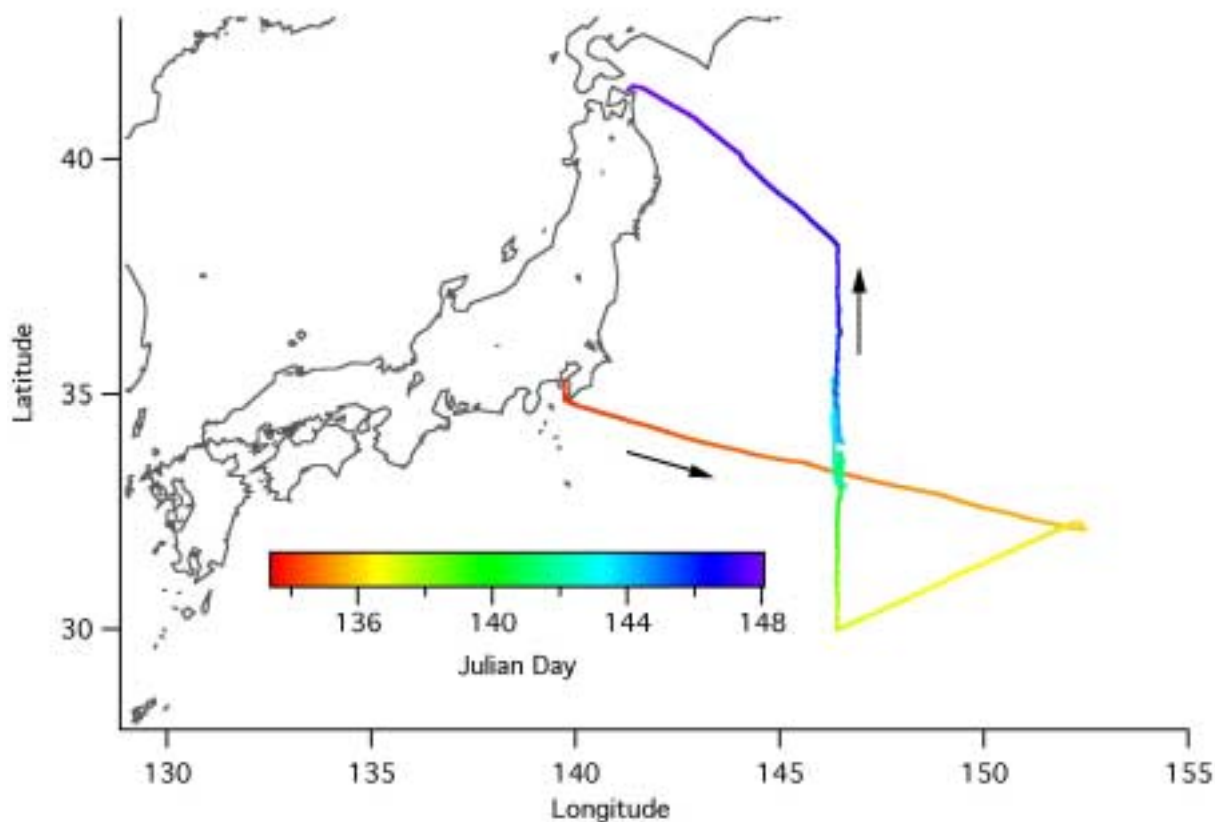
Nobuo Sugimoto

Communications Research Laboratory (CRL)

Hiroshi Kumagai

Japan Ocean Science and Technical Center (JAMSTEC) Kunio Yoneyama

V.B. Mirai Cruise Track



V.C. Mirai schedule and significant events

In situ measurements were performed continuously. The size-dependent lifetime of aerosols was obtained with anthropogenic tracers. After passing a low pressure system, radon and super-micron aerosol concentration increased on 18 May, which was predicted by the Chemical Weather Forecasting System (CFORS) model. As relatively high concentrations of scattering and absorption coefficients, ss-SO_4^{2-} , Al, Fe, and EC were measured, both anthropogenic material and soil particles were present during this period. All the aerosol samples of organic species collected in the western North Pacific showed the predominance of oxalic acid followed by malonic or succinic acid. Lidar observations were performed at the same time with a 95-GHz cloud profiling radar throughout the cruise (May 14-27). Plumes of dust were observed on May 20-21 and 25-26. On May 26, a layered structure of dust and anthropogenic aerosols was observed. These plumes were also measured with an OPC sonde on the kytoon. Comparing the model prediction by the CFORS, this air mass seemed to be sulfate aerosol plumes from the

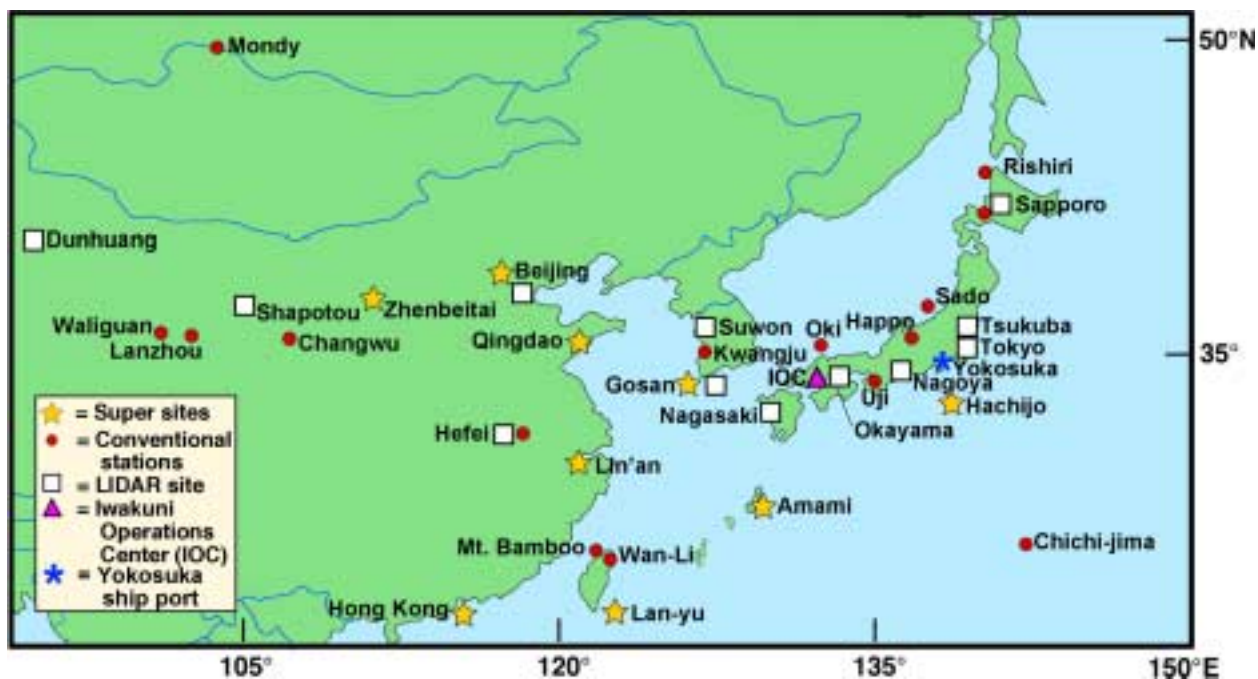
Asian continent. Microphysical parameters of ice and water clouds were analyzed using the lidar and the cloud profiling radar data. Bistatic lidar experiments were also performed to measure water cloud particle size.

V.D. Where to find Mirai data

Interested parties should contact the Mirai lead scientist, Dr. Kazuhiko Miura miura@rs.kagu.sut.ac.jp or Dr. Mitsuo Uematsu uematsu@ori.u-tokyo.ac.jp to discuss collaborative use of Mirai data.

VI. Surface Network Sites

Surface measurements related to ACE-Asia objectives were made at each of the sites on this map. For those sites not detailed below, contact the ACE-Asia Executive Committee member for that country for information: Japan: Kimitaka Kawamura kawamura@lowtem.hokudai.ac.jp; PRC: Shi Guangyu shigy@mail.iap.ac.cn; South Korea: Young J. Kim yjkim@kjist.ac.kr; Chinese Taipei: Shaw Liu shawliu@earth.sinica.edu.tw.



VII. ADNet Lidar Network

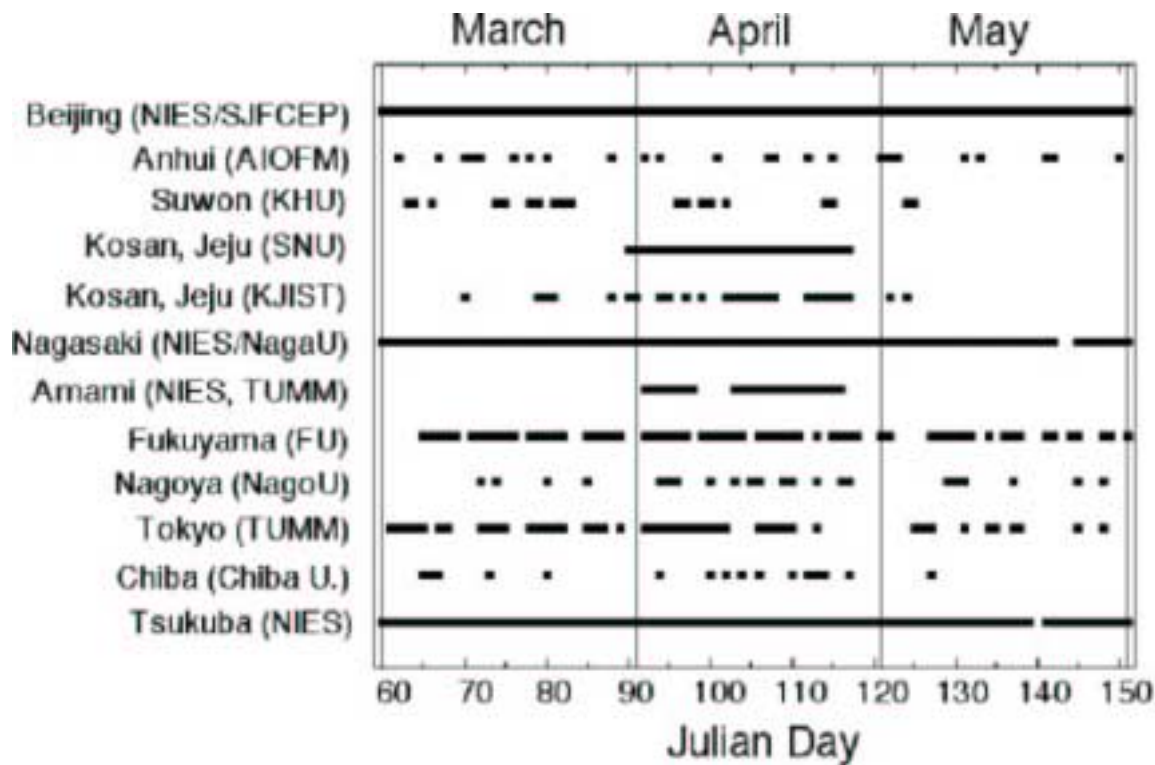
Instrument & Wavelengths	Location	Dates Operating	PI	Institution
Mie dual-polarization lidar, 532 nm, NIES Compact Mie Lidar	Beijing, 39.9N, 116.3E	Mar 1 - May 31 (continuous except Apr 14, May 1, 2)	Nobuo Sugimoto nsugimot@nies.go.jp	National Institute for Environmental Studies, Japan
Mie dual-polarization lidar, 532 & 1064nm, NIES Compact Mie Lidar	Nagasaki, 32.78N, 129.86E	Mar 1 - May 31 (continuous except May 23, 24)	Nobuo Sugimoto nsugimot@nies.go.jp	National Institute for Environmental Studies, Japan
Mie dual-polarization lidar, 532 nm, NIES Compact Mie Lidar	Tsukuba, 36.05N, 140.12E	Mar 1 - May 31 (continuous except May 20)	Nobuo Sugimoto nsugimot@nies.go.jp	National Institute for Environmental Studies, Japan
Mie dual-polarization lidar, 532 & 1064nm, NIES Compact Mie Lidar	Amami, 28.44N, 129.70E	Apr 2-8	Nobuo Sugimoto nsugimot@nies.go.jp	National Institute for Environmental Studies, Japan
Mie dual-polarization & Raman lidar, 532 & 1064nm	Tokyo, 35.66N, 139.80E	Mar 2-6, 8, 9, 13-16, 19-23, 26-28, 30, Apr 2-12, 16-20, 23, May 5-7, 11, 14, 15, 17, 18, 25, 28	Toshiyuki Murayama murayama@ipc.tosho-u.ac.jp	Tokyo University of Mercantile Marine, Japan
Mie lidar (Ceilometer), 905 nm, Vaisala CT25K	Amami, 28.44N, 129.70E	Apr 13-26	Toshiyuki Murayama murayama@ipc.tosho-u.ac.jp	Tokyo University of Mercantile Marine, Japan
Mie dual-polarization lidar, 532 nm	Fukuyama, 34.47N, 133.23E	Mar 6-10, 12-17, 19-23, 24-30, Apr 2-7, 9-14, 16-21, 23, 25-28, May 1, 2, 7-12, 14, 16-18, 21, 22, 24, 25, 28, 29, 31	Naoki Kagawa kagawa@psws.fuee.fukuyama-u.ac.jp	Fukuyama University, Fukuyama, Japan
Mie dual-polarization & Raman lidar, 355, 532 & 1064 nm	Nagoya, 35.1N, 137.0E	Mar 13, 15, 21, 26, Apr 4-6, 10, 13, 15, 16, 19, 20, 23, 26, 27, May 9-11, 17, 25, 28	Takashi Shibata tshibata@stelab.nagoya-u.ac.jp	Nagoya University, Nagoya, Japan
Mie dual-polarization lidar, 355, 532 & 1064 nm	Chiba, 35.58N, 140.10E	Apr 4, 10, 12, 16, 20, 22, 27	Hiroaki Kuze hkuze@ceres.cr.chiba-u.ac.jp	Center for Environmental Remote Sensing, Chiba University, Japan
Mie lidar, 532 nm	Hefei, 31.90N, 117.16E	Mar 3, 8, 11-13, 17, 19, 21, 29, Apr 2, 4, 11, 17, 18, 22, 25, May 1-3, 11, 13, 21,	Jun Zhou jzhou@aiofm.ac.cn	Anhui Institute of Optics and Fine Mechanics, Hefei, Anhui, China

Mie dual-polarization & Raman lidar, 355, 532 & 1064 nm	Suwon, 37.14N, 127.04E	22, 30 Mar 4, 5, 7, 15, 16, 19, 20, 22-24, Apr 6, 7, 9, 10, 12, 24, 25, May 4, 5	Choo-Hie Lee ilekhu@ile-lidar.re.kr	Institute for Laser Engineering, Kyung Hee University, Korea
Mie lidar, 523 nm, Micro-Pulse Lidar	Gosan, Jeju 37.28N, 126.17E	Mar 31- Apr 27 continuous	Soon-Chang Yoon yoons@snu.ac.kr	Department of Atmospheric Sciences, Seoul National University, Seoul, Korea
Mie dual-polarization & Raman lidar, 355, 532 & 1064 nm	Gosan, Jeju 37.28N, 126.17E	Mar 11, 20-22, 29, 31, Apr 1, 4, 5, 7, 9, 12-18, 22-27, May 2, 4	Young-Joon Kim yjkim@kjist.ac.kr	Kwangju Institute of Science and Technology, Korea

Some quick look images and links to the PI institutions are found on the AD-Net www site (<http://info.nies.go.jp:8094/AsiaNet/>). For analyzed data and raw data, contact PIs directly. In addition,

- Numeric data of Amami ceilometer and TUMM/Tokyo lidar are available from ACE-Asia Data Management site.
- Quick look images of NIES lidars are available from <http://info.nies.go.jp:8094/ACEAsia/index.html>.
- Numerical data of SNU MPL data are available from <http://air.snu.ac.kr/AceAsia/main.html>.





VIII. Gosan (formerly Kosan) Site on Jeju (formerly Cheju) Island

VIII.A. Table of instruments and participants

Measured parameter	Instrument/technique	PI	Institution
Aerosol backscatter	Multichannel LIDAR,	Young J. Kim	K-JIST, Korea
Size segregated elemental composition	Cascade impactor	Kyoo W. Lee	K-JIST, Korea
Aerosol vertical profile, size distribution	Micro Pulse LIDAR, OPC, sunphotometer	Soon C. Yoon	SNU, Korea
Met. Parameters, water vapor and total ozone columns, sky brightness	AWS, Radiosonde, OPC, Yankee Sunphotometer, PREDE Skyradiometer	Byung C. Choi	METRI, Korea
Major ions vs size	MOUDI impactor	Kil-Choo Moon	KIST, Korea
PM10 and PM2.5 aerosols, BC, VOCs, size distribution, aldehydes	PM2.5 Sampler, PM10 Sampler, APS, TEOM, ACPM, filter packs, Anderson sampler	Jin S. Han	NIER, Korea
TSP Organics	TSP Hi-Vol	Chang-H. Kang	Cheju Natl. Univ., Korea
Major ions	Ion chromatography	Dong-Su Lee	Yensei Univ.

Ionic and elemental compounds, EC/OC	PM2.5, PM10, and TSP samplers, MOUDI impactor	James Schauer	Univ. of Wisconsin, USA
DMS, CS ₂	GC-PFPD	Hilton Swan	AGAL, Australia
Radon-222	ANSTO radon detector	Wlodk Zahorowski	ANSTO, Australia
Aerosol chemical components	PM2.5 and PM10 samplers	David Cohen	ANSTO, Australia
Submicron particle size distribution, Particle hygroscopic growth	Twin scanning electrical mobility analyzer, Hygroscopic tandem differential mobility analyzer	Fred Brechtel	Brookhaven National Lab, USA
Elemental composition of individual particles	Single particle time of flight mass spectrometer (TOFMS)	Dan Imre Alla Zelenyuk	Brookhaven National Lab, USA
Single particle analysis by SEM and TEM	Single particle sampler	Jim Anderson	Arizona State Univ., USA
Ionic and elemental compounds	High-volume TSP sampler	Richard Arimoto	CEMRC/New Mexico State Univ., USA
Time-resolved aerosol composition	3-stage DRUM sampler 8-stage DRUM Sampler	Thomas Cahill, Steven Cliff	Univ. of California at Davis, USA
Chemical composition	Two filter Pack sampler Low pressure cascade impactor	Mikio Kasahara	Kyoto Univ, JAPAN
Direct, diffuse, and total solar irradiance	Total Solar Broadband Radiometer, Fractional Solar Broadband Radiometer	Francisco Valero	UCSD/Scripps Institute of Oceanography, USA
Scattering coefficient (RH), Absorption coefficient	Nephelometers, Particle Soot Absorption Photometer (PSAP)	John A. Ogren Anne Jefferson	NOAA/CMDL, USA
Aerosol size distribution, Aerosol chemistry	DMPS, ASASP, Aerosol Mass Spectrometer	K. N. Bower	UMIST, UK
LMW dicarboxylic acids in aerosols	Hi-Vol TSP with quartz filters	K. Kawamura and M.H. Lee	Hokkaido Univ. and Korea Univ.
Ionic, elemental, and organic compounds, OC/EC	Hi-Vol Denuder/Filter sampler Improve-Tube sampler	J. Yu H. Yang	Hong Kong Univ. of Sci. & Tech., Hong Kong

VIII.B. Asian Dust Observations at Gosan Super Site

Date	Characteristics	Comments
9 April 2001	Hazy Marine Air Mass	From east over Japan and local sources
11-13 April 2001	Asian Dust	From northwestern Chinese deserts regions through urban and industrial areas and over the Yellow Sea
25-26 April 2001	Asian Dust	From northeastern Chinese sandy areas through Korean peninsular
29 April 2001	Clean Marine Air Mass	Isolated marine air mass from south

VIII.C. Gosan events and observations

All aerosol measurements made by various groups at the Gosan super site during the ACE-Asia IOP are summarized above. For aerosol characterization purposes, extensive sets of aerosol parameters including physical, chemical and optical properties were measured. Daily sampling of PM₁₀ and PM_{2.5} aerosol were conducted to investigate the temporal variation in aerosol chemical composition. Two Lidar systems, a Mie backscatter Lidar and a micropulse lidar were also deployed to monitor vertical profile of aerosol particles. In-situ measurements of optical properties of aerosols such as scattering coefficient and absorption coefficient were also made at the surface. Spectral solar irradiance was measured to investigate the aerosol's effect on radiation and monitor column-integrated aerosol optical depth.

The Gosan super site (126°10'E, 33°17'N) on Jeju Island, Korea is located between major aerosol source regions. Monitoring of physico-chemical and optical properties of aerosols and air mass back-trajectory analysis revealed that different aerosol characteristics were observed depending on the meteorological conditions. Aerosol characteristics observed at Gosan showed that it was frequently impacted by Asian desert dust storms and anthropogenic sources located in China, Korea, and Japan, depending on the air mass history. Two major Asian Dust outbreaks were observed at Gosan super site, 11~13 April and 25~26 April during the ACE-Asia IOP. Results of air mass back trajectory analysis confirmed by model simulations showed that the two dust events originated from different source regions. The first one originated from the northwestern Chinese desert region had traveled through Chinese coastal industrial areas and over the Yellow sea. The latter one originated from the sandy area in northeastern China and had passed over the Korean peninsula before it reached Gosan.

On a clean marine event day of 29 April the mass concentrations of fine and coarse fractions of PM₁₀ particles were measured to be 2.38 and 6.51 $\mu\text{g}/\text{m}^3$, respectively when the air mass had traveled over the Pacific ocean from south. On a hazy marine event day of 9 April highly elevated level of non-sea-salt sulfate in the fine mode was observed when the air mass had traveled from east over Japan and was impacted by local sources. On Asian dust event days of 13 and 25 April PM₁₀ mass concentration was measured to be 106 and 66 $\mu\text{g}/\text{m}^3$, respectively. However, the mass fraction of carbonaceous particles in the fine mode increased almost three

fold on 25 April, which suggests that the latter event was influenced heavily by anthropogenic sources.

Significant daily variation in aerosol concentrations and composition of trace elements was observed at Gosan. The atmospheric levels and composition of Al, K, Ca, Mg, Ti, Fe, Rb, Sr, Ba, La, Ce, and U at Gosan were dominated by Asian desert soil dust during the entire study period. In contrast, Cu, Zn, As, Mo, Ag, Cd, Sb, Cs, W, and Pb found in the Gosan aerosol samples resulted predominantly from urban and industrial pollution sources located in East Asia. Water-soluble ion components in the PM_{2.5} and PM₁₀ samples show that nitrate as well as Ca²⁺ ion concentrations in the coarse mode increased during the Asian dust periods.


Lidar observed the vertical profiles of atmospheric aerosol backscatter at 532nm wavelength. Especially on 13 April, lidar data showed two distinct layers at around 4km and below 2 km altitude. Air mass back trajectory analyses show that the upper layer was originated from the northwestern Chinese desert regions while the lower one from southeastern China, resulting in aerosol characteristics of desert aerosol mixed with anthropogenic pollution in the Gosan surface samples. The highest value of aerosol optical depth (AOD) ranging from 0.60 to 0.93 was observed at Gosan on that day. Lidar-derived AOD was compared with that obtained by a ground-based sunphotometer.

In-situ measurement results showed that the aerosol scattering coefficient was highly variable ranging between 20 and 250 Mm⁻¹. The aerosol single scattering albedo (SSA) during the Asian dust events declined slightly to ~0.80 for total aerosol and as low as 0.63 for submicrometer aerosol. Most of aerosol absorption was found in the submicrometer particles. The aerosol hygroscopic growth factor, a measure of the increase in scattering due to aerosol water uptake, was relatively high during the dust events, ranging from 1.5 to 2.5. The low SSA and high hygroscopic growth factor indicate the aerosol at Gosan super site was composed of not only dust but also likely had absorbing elemental and hygroscopic species such as sulfate, oxidized organics, and sea salt.

IX. VMAP Network

IX.A. Table of instruments and participants

Prof. Mitsuo Uematsu was responsible for the VMAP network measurements at these four sites.

Instruments information 

Measurements	Rishiri	Sado	Hachijo	Chichi-jima
Aerosol PM2.5 OC/EC	●	●	●	●
Fine & Coarse Major Ions	●	● (2001.11)	●	●
Fine & Coarse Trace Elements	●	● (2001.11)	●	●
Bulk Organic Compounds			○	○
Black Carbon			○	○
Aerosol Number Concentration	●		○	●
Ozone	○	△	●	○
CO	○			
SO ₂			●	
Radon	○	●	○	○
Particle Mass PM2.5 or 10 TEOM	△	△		△
Weather Condition (Temp, Humid, Pres, Wind D&S, Ppt)	●	△	●	●

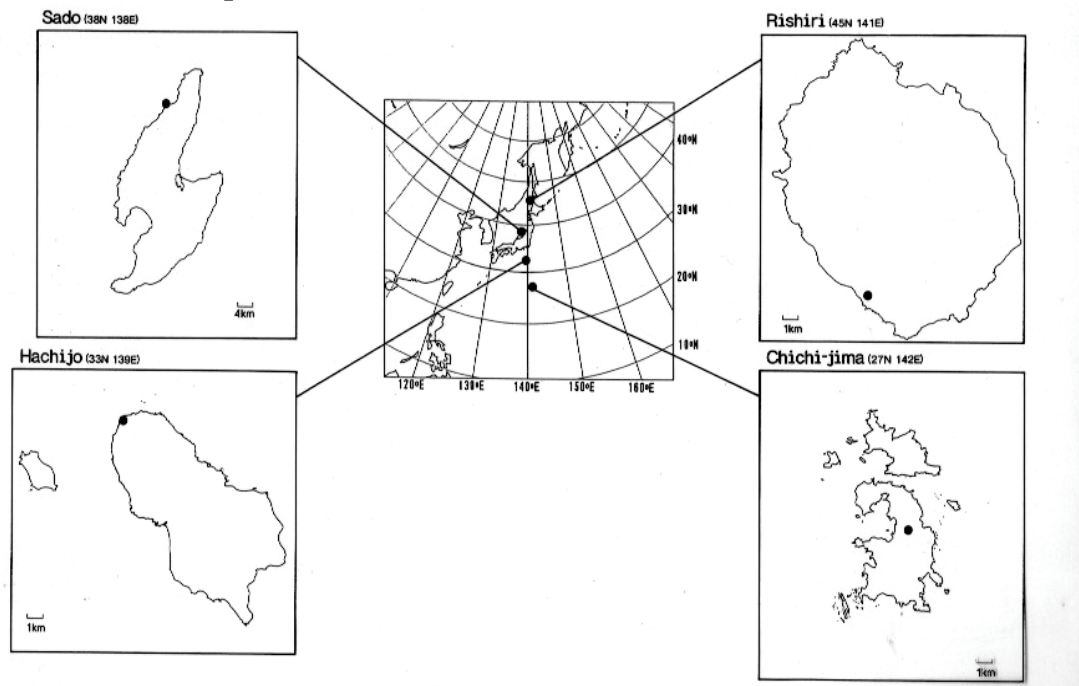
● (in operation by us); ○ (by others); △ (from EANET)

IX.B. Significant VMAP events and observations

The VMAP (Variability of Marine Aerosol Properties) network covered a large area along 140E from 27 to 45N. The data are comparable without consideration of analytical methods, sampling technique etc. The network was in operation until May 2002 which covered over one year. The VMAP chief scientist was Prof. Mitsuo Uematsu of Tokyo University (uematsu@ori.u-tokyo.ac.jp).

In Rishiri, enhanced concentrations of ionic species (nss-SO_4^{2-} , NO_3^- , NH_4^+ and nss-Ca^{2+}) were observed in the outbreaks of continental polluted air masses. Several outbreak events were found in Rishiri during ACE-Asia campaign, and higher concentrations of dust species were observed from 9 to 11 April. Our results demonstrated that nss-SO_4^{2-} and NH_4^+ co-exist in fine particles, NO_3^- and nss-Ca^{2+} co-exist in coarse particles, and each set is respectively transported in the one under way. Atmospheric behaviors of sulfate, nitrate and carbonaceous species are different from each other, although they are mainly derived from combustion processes.

IX.C. Map of VMAP sites



IX.D. Where to find VMAP data.

The VMAP data can be obtained from Prof. Uematsu uematsu@ori.u-tokyo.ac.jp or from the website: www.pmel.noaa.gov/aceasia/

X. APEX & Amami Ohshima site

X.A. Instruments and participants

Nakajima, Teruyuki, APEX project scientist
Center for Climate System Research (CCSR), University of Tokyo
4-6-1 Komaba, Meguro-ku, Japan
Tel. +81-3-5453-3959; Fax. +81-3-5453-3964
e-mail: teruyuki@ccsr.u-tokyo.ac.jp

Amami Ohshima Island (28N22", 128N30")
Site scientist: Tamio Takamura, CeRES

Instrumentation

- Up/down looking flux radiometers: Kipp&Zonen CM-21 (SW), Eppley PIR (LW)
- skyradiometer, PREDE
- Sunphotometer, PREDE
- Microwave radiometer: Radiometric WVR-1100, 23.8GHz, 31.4GHz
- Two wavelength Lidar, NIES

This lidar malfunctioned in the latter half of the period and we had an emergency operation of

- single wavelength lidar
- Integrating Nephelometer, M903
- Absorption photometer, PSAP
- Aerosol sampling
- Polarimeter, Prof. S. Mukai's group

APEX Participants and Collaborators:

Nakajima, Teruyuki, e-mail: teruyuki@ccsr.u-tokyo.ac.jp
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Takemura, Toshihiko, e-mail: toshi@riam.kyushu-u.ac.jp
Takigawa, Masayuki, e-mail: takigawa@jamstec.go.jp
Toshiaki Takano, e-mail: takano@cute.te.chiba-u.ac.jp
Uchiyama, Akihiro, e-mail: uchiyama@mri-jma.go.jp
Uno, Itsushi, e-mail: iuno@riam.kyushu-u.ac.jp

X.B. Interesting days and observations

On 10 April, there was almost pure sulfate aerosols from Sakurajima volcano with single scattering albedo almost 1. Also 11-16 April: during a Kosa dust event the small single scattering albedo went as low as 0.8.

X.C. APEX data can be found at <http://duckbill.ccsr.u-tokyo.ac.jp/index.php>

XI. Taiwan/ACE-Asia Ground Station Measurements

XI.A. Instruments and Participants

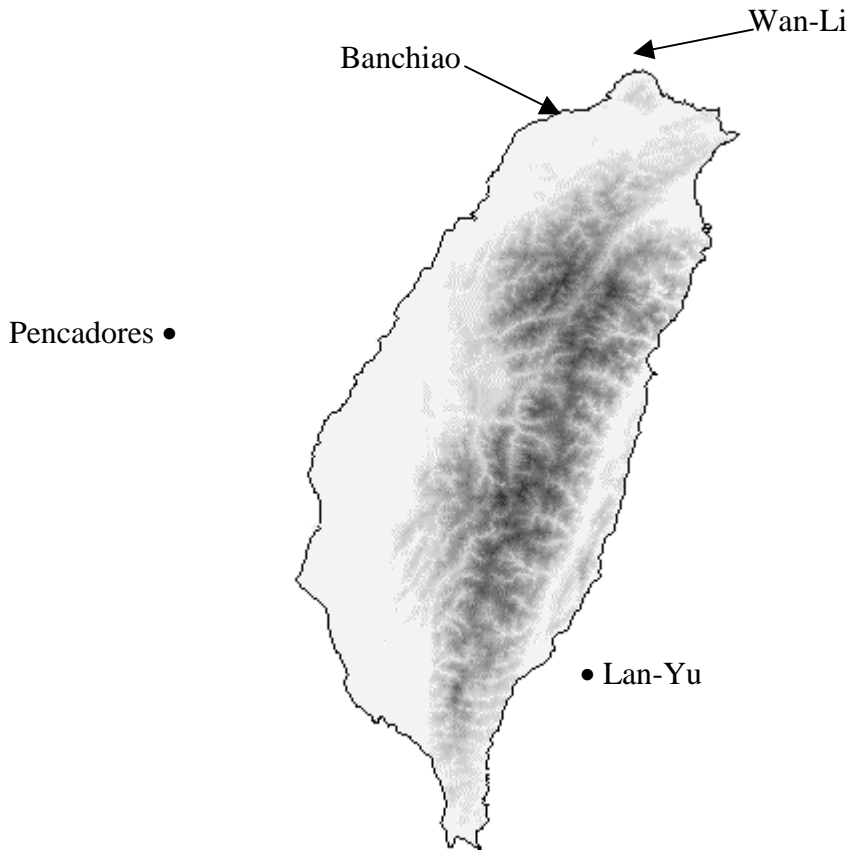
Participant	Project	Organization
Prof. J. P. Chen (PI)	aerosol and cloud physics/chemistry	National Taiwan University
Prof. P. H. Lin	Meteorology and radiation	National Taiwan University
Dr. Fujung Tsai	Database management	National Taiwan University
Prof. C. T. Lee	aerosol chemistry and optical measurement	National Central University
Prof. Shaw Liu	ozone chemistry, atmospheric chemistry modeling	Academia Sinica of Taiwan
Dr. T.-Y. Chen	CFCs and HCs sampling and analysis	Academia Sinica of Taiwan
Prof. C.-S. Yuan	aerosol chemistry	National Sun Yat-sen University
Prof. S. C. Long	analytical chemistry	Chung Shan Medical & Dental College
Dr. H. W. Chang	Lan-Yu baseline station and ozonesonde	Central Weather Bureau

Site	Aerosol Particles					Gases	Meteorology	Ozone sonde
	Microtop	Moudi	PMS-ASAPX	SMPS	Improve			
Wan-Li	√	√	√	√	√	√	√	
Lan-Yu	√				√	√	√	
Pescadores					√			
Banchiao								√

Instruments

	Instruments	Parameter
Aerosol Particles	MICROTOP	Aerosol optical depth and chemistry
	MOUDI	Aerosol mass spectrum, 10 stages at 0.18-18 μ m
	PMS-ASAPX	Aerosol size spectrum, 32 channels at 0.1-3.0 μ m
	SMPS	Aerosol size spectrum, 147 channels at 0.01-0.5 μ m
	IMPROVE	Mass concentration PM _{2.5} (daily) Soluble (daily) Carbons (daily) Metals (daily)
Gases	Annual denuder	SO ₂ , HNO ₂ , HNO ₃ , NH ₃
	Gas sampler	CFC _s , VOC _s
Meteorology	U,T,RH (per min)	
Ozonesonde	Ozone (2/week)	

XI.B. ACE-Asia ground sites in Taiwan



XI.C. Schedule of Instruments and Measurements in Taiwan

Date	MAR15		APR1					MAY1		
Wan-Li MICROTOP			3/29-3/31		4/9-4/13					
Wan-Li MOUDI			3/23-5-9							
Wan-Li PMS- ASAPX			3/23-4/2		4/4-4/30					
Wan-Li SMPS			3/23-4/2	4/4-4/7		4/11-4/2		4/20-/4/30		
Wan-Li IMPROVE		3/22-3/24	3/31	4/1-4/3	4/6	4/8	4/10-4/19	4/23-4/24	4/26-4/30	5/2/5/7
Wan-Li GASES			3/23-5/9							
Wan-Li Meteorology			3/23-5/9							
Lan-Yu MICROTOP	3/15	- 3/16	3/19-3/30	4/1-4/3		4/5-4/8	4/10		4/14-/5/9	
Lan-Yu GASES			3/23-5/9							4/12
Lan-Yu MICROTOP			3/23-5/9							
Pescadores IMPROVE			3/30-5/5							
Banchiao Ozonesonde			3/23-5/9							

XI.D. Where to find Taiwan data

The Taiwan data are available on the home page <http://cats.as.ntu.edu.tw>

XII. Hong Kong network site

XII.A. Measurements (Hok Tsui; 22°13'N, 114°14'E, 60 m asl)

Parameter	Instrument/Technique	PI	Institute	Operational Dates
Ozone	TEI model 49C/UV photometry	Tao Wang	HKPolyU	Since 1994
CO	Modified TEI 48S/Gas filter correlation non-dispersive infrared	Tao Wang	HKPolyU	Since 1994
NO	TEI 42C-Y Trace Level/Chemiluminescence	Tao Wang	HKPolyU	February 2001-April 2002
NOy	TEI 42C-Y Trace Level MoO Converter/Chemiluminescence	Tao Wang	HKPolyU	February 2001-April 2002
SO2	TEI 43S/UV fluorescence	Tao Wang	HKPolyU	February 2001-April 2002
CH4 and C ₂ -C ₈ NMHCs	Canister sampling/GC-FID & MS	Tao Wang/Donald Blake	HKPolyU/U CI	March 2001-April 2002; approx. every six days and more frequent during intensive periods
C ₁ -C ₂ Halocarbons	Canister sampling/GC-ECD & MS	Tao Wang/Donald Blake	HKPolyU/U CI	March 2001- April 2002; approx. every six days and more frequent during intensive periods
C ₁ -C ₅ Alkyl nitrates	Canister sampling/GC-ECD & MS	Tao Wang/Donald Blake	HKPolyU/U CI	March 2001- April 2002; approx. every six days more frequent during intensive periods
Carbon monoxide	Canister sampling/GC-FID	Tao Wang/Donald Blake	HKPolyU/U CI	March 2001- April 2002; Approx. every six days more during intensive period
PM2.5	IMPROVE Cyclone sampler. Teflon Filters	David Cohen	ANSTO	1 Jan01 to 30 Jun04 every Wednesday and Sunday for 24hrs, every second day during IOPs
PM10	GENT Stacked Filter Unit, Nuclepore filters	David Cohen	ANSTO	1 Jan01 to 30 Jun04 every Wednesday and Sunday for 24hrs, every second day during IOPs
PM2.5 and PM10 mass and multi-elemental analysis, including black carbon estimates	Ion Beam Analysis, using 3 MV Van de Graaff Accelerator on all Teflon and Nuclepore filters for over 20 different elemental species from H to Pb	David Cohen	ANSTO	1 Jan01 to 30 Jun04 every Wednesday and Sunday for 24hrs, every second day during IOPs
Radon-222	Instrument: Radon detector Technique: Dual loop two filter radon detector [1]	Wlodek Zahorowski	ANSTO	01 Jan01 to 30 Jun04 Hourly radon concentrations are continuously detected

Note: HKPolyU: Hong Kong Polytechnic University
 UCI: University of California at Irvine
 ANSTO: Australian Nuclear Science and Technology Organization

XII.B. Hong Kong Overview

As a cooperative effort with the TRACE-P and ACE-Asia intensive campaigns in spring 2001, trace gases and aerosols were measured at the Hong Kong Polytechnic University's Atmospheric Research Station at Hok Tsui in southeastern Hong Kong. The main objective of the measurement program was to provide continuous ground-base data in the subtropical region of eastern Asia and to characterize the southward outflow of continental pollution that prevails in the lower atmosphere during early spring. The field measurement was a collaborative effort of scientists from the Hong Kong Polytechnic University, University of California at Irvine, and the Australian Nuclear Science and Technology Organization. The site is situated on a cliff with 240 degrees of ocean view stretching from northeast to southwest. Urban areas of Hong Kong are approximately 10 km from the site and are normally downwind under the prevailing conditions.

Trace gases: O₃, NO, NO_y, CO and SO₂ were measured real-time by the HKPolyU team. Whole air samples were collected in canisters which were sent to the University of California at Irvine to determine the concentrations of methane, C₂-C₈ non-methane hydrocarbon, C₁-C₂ halocarbons, and C₁-C₅ Alkyl nitrates. Analysis of the trace gas data has indicated a complex mix of local, sub-regional, and continental pollution with chemical signatures from urban pollution, biomass burning, and ship exhaust. Aerosol data also show long-range transport of dust to the site during spring 2001. Southward movement of cold fronts are the principle mechanism for transporting continental pollution (gases and particles) to the marine boundary layer of the South China Sea in the spring season.

PM_{2.5} and PM₁₀: PM_{2.5} and PM₁₀ particle size fractions were measured every Wednesday and Sunday since 1 January 2001 at the Hong Kong Hok Sui site. Accelerator based ion beam analysis (IBA) techniques were used to quantify major components as well as significant trace elements. These included, total hydrogen, black carbon, F, Na, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Br, and Pb with sensitivities close to or below 1ng/m³. Soil fingerprints for the east Asian region have been generated using oxides of measured Al, Si, K, Ca, Ti, Mn and Fe concentrations. [PM₁₀/PM_{2.5}] mass ratios were typically (2.1±0.4) averaged across a year. [PM₁₀/PM_{2.5}] mass ratios for the twenty one IBA elements have also been analyzed. This quantitative data set provides both masses and dates and provides useful input for aerosol movement modelers studying the east Asia region.

²²²Radon: ²²²Rn was measured with a dual-flow loop two-filter detector [1]. Four radon detectors were deployed in Southeast Asia and the Pacific Ocean to record hourly radon concentration in air at selected ACE-Asia ground stations. They include instruments at Hong Kong (HokTsui site, 22°12'N, 114°15'E), Jeju Island (Kosan site, 33°15'N, 126°15'E), Sado Island (38°02'N, 138°14'E) and Mauna Loa Observatory (19°28'N, 155°36'W). The lower limit of detection for a one hour radon count was about 40 mBq m⁻³. The response time, defined as the time to reach 50% of maximum count rate after step increase in radon concentration, was about 45 minutes.

Radon-222 measurements at Hong Kong, Kosan, Sado and MLO

Site & Operational Dates	Parameter	Instrument/Technique	PI	Institute
Hok Tsui (Hong Kong, China) 01 Jan01 to 30 Jun04	Radon-222	Instrument: Radon detector Technique: Dual loop two filter radon detector [1] Sampling frequency: Hourly radon concentrations are continuously detected	Wlodek Zahorowski	Australian Nuclear Science and Technology Organisation (ANSTO)
Jeju Is (Kosan, Korea) 01 Nov00 to 30 Jun04				
Sado Is (Japan) 01 Sep01 to 30 Jun04				
Mauna Loa (Hawaii, USA) From 1990				

XII.C. Table of days in 2001 for which the measured PM2.5 mass exceeded 90 µg/m³ at the Hong Kong Site

Date	PM2.5 Mass (µg/m ³)	Comments on high PM2.5 Events
28-Feb-01	94	High sulfate
10-Mar-01	103	High soil and high sulfate
11-Mar-01	94	High soil and high sulfate
26-Sep-01	91	High sulfate
11-Nov-01	91	High sulfate
26-Dec-01	109	High soil and high sulfate
30-Dec-01	100	High soil and high sulfate

XII.D. Where to find Hong Kong data

Trace gases: O₃, CO, NO, NO_y and SO₂ between February 19-April 30, 2001 can be obtained by contacting Tao Wang at e-mail address: cetwang@polyu.edu.hk; for organic data please contact Donald Blake (E-mail: dblake@orion.oac.uci.edu)

PM2.5 and PM10: PM2.5 and PM10 data for 24 hour period for each Wednesday and Sunday during the first quarter of 2001 can be found on the ACE Asia WEB site. It includes mass concentration as well as concentrations of over to 20 different elemental species measured between H and Pb including black carbon estimates. For request of other data, please contact David Cohen at: dcz@ansto.gov.au

Radon: Hourly radon concentrations for all but the Sado site covering the ACE-Asia IOP (March to May 2001) period have been submitted to the ACE Asia WEB site. Other data can be obtained on request from the PI (wlodek.zahorowski@ansto.gov.au).

XIII. Peoples Republic of China sites

XIII.A. Measurements and participants

Contribution from China Dust Storm Research (ChinaDSR) project in spring of 2001 to ACE-Asia IOP.

Sampling Station	Site description	Instrument	Measurements	PI, Institutions, and site to find data
Aksu in Xinjiang (40° 16' N, 80° 28'E); annual precipitation <50 mm; mean temperature: ~10°C 13 May to 3 June	1028 m asl; 80 km east of Aksu city (Xinjiang province, China); hyper-arid area at northern margin of Taklimakan desert	Andersen AN200	Loadings of TSP, 20 elements of 18 day-time (normally from 9:00 to 17:00) bulk aerosol samples collected from a 20 m-tall building.	Xiao-ye ZHANG Institute of Earth Environment, CAS 10 Henghui S. Rd., PO Box 17, XiAn 710075, China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm
Beijing (39° 56' N, 116° 21' E), 100 m asl	Tower at Inst. of Atmos. Physics	8 stage drum impactor	Elements vs size	T. Cahill, UC Davis, USA
Beijing		Radiometers	Radiative fluxes	Prof. Guangyu Shi, Inst. of Atmos. Physics, CAS, China
Dunhuang (DH) (40°30'N, 94°49'E); (annual precipitation: ~50 mm; mean temperature: ~10°C) 29April to 31 May	1380 m above the sea level; 25 km southeast of Dunhuang city (Gansu province, China); located in a hyper-arid area at Kumtag Desert	Andersen AN200	Loadings of TSP, 20 elements of 30 day-time (normally from 10:00 to 16:00) bulk aerosol samples collected from a 10 m-tall building	Xiao-ye ZHANG Institute of Earth Environment, CAS China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm
DH		IMPROVE sampler	Twenty-five pairs of PM2.5 aerosol samples were collected from 8 to 30 April 2001 from the 10m level of a tower:	Richard Arimoto CEMRC/New Mexico State University, USA arimoto@cemrc.org

			elements and ionic species	
DH		Anderson HiVol and UW LowVol	PM10, PM2.5, Chemical analysis.	Dr. James Schauer University of Wisconsin - Madison, USA jschauer@engr.wisc.edu
DH		Sun Photometers (Cimel, MFR, S3); Total Sky Imager; Micro Pulse Lidar; Broadband Radiometers (PSP, NIP, PIR); Spectrometers; Scanning Microwave Radiometer; Particle Sizer (APS); Nephe; Aerosol sampler; Meteo.	Radiative properties; vertical structure of aerosol and cloud layer; Chemical composition	Dr. Si-Chee Tsay NASA Goddard Space Flight Center, USA tsay@climate.gsfc.nasa.gov
Zhenbeitai (ZBT), Yulin (38°17' 23"N, 109° 42'18"E); annual precipitation: 300-400 mm; mean temperature: ~8°C). 19 Feb to 21 May	1135 m above the sea level; 10 km north of Yulin (Shaanxi Province, China); along the southeastern edge of Mu Us desert. Areas north of ZBT are a vast hyper-arid region	RP-2025	58 12-hour (day-time) samples collected under northerly wind flow from a 20 m-tall tower at ZBT.	Xiao-ye ZHANG, Rich Arimoto, & Barry Huebert Institute of Earth Environment, CAS, China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm
ZBT		Sun Photometer; Equipment for emission flux analysis	Optical properties; Emission flux measurements for dust aerosol; Chemical composition	Dr. Laurent Gomes CNRM/GMEI, FRANCE laurent.gomes@meteo.fr Sunphotometer data at: http://aeronet.gsfc.nasa.gov:8080/
ZBT			Optical properties; PM-2.5, EC/OC, Ion, Elements	Dr. Michael H. Bergin Georgia Institute of Technology, USA mike.bergin@ce.gatech.edu

ZBT		8 stage drum impactor	Elements vs size	T. Cahill, UC Davis, USA
Changwu (CW) (35°12'N, 107°40'30"E) ; annual precip: ~590 mm; mean temp: ~9°C 8 March to 31 May	1220 m above the sea level; 100 km away from XiAn city, locates on the midwest of the Loess Plateau	RP-2025	85 day time (6:00–8:00 and 11:00–13:00) bulk aerosol samples collected from a 20 m-tall building	Xiao-ye ZHANG Institute of Earth Environment, CAS, China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm
Heifei, (31° 20' N, 117° 5' E)		8 stage drum impactor	Elements vs size	T. Cahill, UC Davis, USA
Lanzhou (36°03'N, 103°53'E); annual precipitation: 315 mm; mean temperature: 9.3°C 14-15; 19-20 April; 21-24 May	1518 m above the sea level; site in urban area of Lanzhou city, locates on the northwest of the Loess Plateau	KB-120	28 daily TSP loadings, each averaged from ~10 bulk samples (sampling time normally ranged from 0:00 to 24:00) collected from a 10 m-tall building during DS days	Xiao-ye ZHANG Institute of Earth Environment, CAS, China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm
Shaputou (37°30'N, 105°E); annual precipitation <50 mm; mean temperature: ~10°C) March 18-25; April 4, 13, 28; May 5-14	1335 m above the sea level; 22 km west of Zhongwei, Gansu prov, China); located in southern margin of Tengger desert	Sibata HV1000F	14-day time bulk aerosol samples collected from a 20 m-tall building.	Xiao-ye ZHANG Institute of Earth Environment, CAS, China Xiaoye_02@163.net http://www.ieecas.ac.cn/qirongjiao/ACE-Asia/ACEAsiaData.htm

XIII.B. Where to find PRC data

Most of the data sets above can be found on the ACE-Asia web site, www.pmel.noaa.gov/aceasia/